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TRIP OF RIVERS AND HARBORS COMMITTEE.

HON. T. E. BURTON MAKES AN EXTENDED STATEMENT IN REFERENCE TO IT—WAS OF GREAT VALUE TO THE COMMITTEE.

Hon. T. E. Burton, chairman of the committee of rivers and harbors, was asked by the Review recently in Washington for a statement regarding the extended tour of several members of the committee to the gulf of Mexico and the Pacific coast, and as to what recommendations might be the outcome of it. He has replied in extenso to the first part of the request, but says that etiquette forbids any statement as to recommendations at present. He says:

"In order to frame a river and harbor bill intelligently it is important that the members of our committee make personal investigation of the localities where improvements are contemplated. The late Mr. Holman, economist as he was, said to Gen. Catchings that he favored making an appropriation so that the committee might inspect every project under consideration, for he believed that such examination would save money for the national treasury. Several of us who have had longest service have examined nearly every harbor of importance on the Atlantic, gulf and Pacific coasts, as well as those upon the lakes and leading rivers. Such examination not only gives a very impressive lesson as to the commercial growth of the country, but aids us very materially in our committee work.

"A majority of the members of the committee had never visited the Pacific coast, and consequently, upon invitations from various commercial bodies in California, Oregon and Washington, the recent trip was planned. At different times on our journey fourteen of the seventeen members of the committee of the fifty-sixth congress took part in the inspection.

"We left Washington on the 3d of June and disbanded at Chicago Aug. 4. Our first stop was at Mobile, remaining there one day, and spending the next two days in an examination of the water front at New Orleans. At both these ports there is a phenomenal increase in exports and a demand for better facilities for water transportation.

"We then proceeded to Houston, Tex., stopping on the way to see the flow of oil from the celebrated well Hayward No. 2, near Beaumont. From Houston we went down Buffalo Bayou into Galveston bay to Galveston. There is a proposed improvement here to be obtained by digging a channel 25 ft. deep, 58½ miles from Galveston, through the bay and up Buffalo bayou to Houston. The members of the committee spent some time at Galveston. The damage done to the jetties by the storm last autumn is very considerable. It has been estimated that $1,500,000 will be required for repairs, though when this amount has been expended the jetties will be in somewhat better condition than before the storm. The people of Galveston are showing remarkable pluck and energy in building up the port. The Southern Pacific has very large improvements under way in the preparation of slips and wharves for terminals. There seems every prospect that the volume of shipments from Galveston this autumn will be greater than ever before, notwithstanding the storm.

"From Texas the committee proceeded directly to the Pacific coast, inspecting practically every harbor from San Diego, in California, to Whatcom, in Washington. A distinctive feature of the western sea coast of America is that from the southern extremity of South America to Puget Sound harbors are few and far between.

"There is not an average of one good harbor for each country in South America, practically none in Central America, and two in Mexico, Acapulco and Mazatlan. From San Diego there is no good natural harbor until San Francisco is reached. From San Francisco, again, there is no harbor or entrance which is not handicapped by serious disadvantages until the mouth of the Columbia river is reached, and even here there is at times considerable difficulty in getting over the bar at the mouth. On Puget sound harbors are very numerous, and the same is true in the British possessions north of us and in southeast Alaska. The distinctive feature in these latter localities is the great depth of water extending to the shore. In some cases it is so deep as to cause great inconvenience in the anchoring of boats and the building of wharves.

"The committee received a very hospitable reception on the Pacific coast. The citizens everywhere, as well as commercial bodies and transportation lines, vied with one another in making our visit a delightful one. The display of cordiality was very gratifying to all of us. Even more marked was the desire to give us every facility for obtaining information. They concluded early that we had come for work rather than for a junket. It was notable that San Francisco, Portland and Seattle, the principal centers from which we made examinations, looked out just as carefully for the interests of minor towns in their vicinity as for their own and took pains to afford full opportunity to examine into the prospects and possibilities in other places even though they might in time prove to be rivals.

"The features which upon a first visit to the Pacific coast are most impressive to a person who has spent his life on the Atlantic side or in the middle west are the vast possibilities of that region, the great value of resources, agricultural and mineral, the unlimited supply of timber in some portions, and the great wealth of the fisheries. To these may be added excellence of climate and beauty of scenery. In utilizing all these they are handicapped by remoteness from markets and the consequent high cost of transportation. Their patriotism and energy is worthy of the highest admiration. In an unusual degree they have contended with obstacles interposed by mountains and deserts, and, in former years, the hostility of Indian tribes. Among these disadvantages they have shown a sturdy type of American citizenship. Their hospitality is worthy of all praise. In past years the impression has prevailed there that the Pacific coast was slightingly regarded by the rest of the country, but I think this feeling is passing away.

"A pleasant feature of the trip, which was during the heated term, was the cool temperature and constant sunshine, particularly west of the Cascade mountains. Nothing but the long distance between these localities and the Atlantic coast prevents them from being favorite summer resorts. Opportunities for recreation and climate are unsurpassed anywhere. Whenever the tide of summer migration starts in this direction it will certainly become very large.

"A pleasant feature of the journey was a side trip to Alaska. Little is required there in the way of river and harbor improvements, except, perhaps in Wrangle narrows, where a deepening and widening of the channel would be desirable. Much is required, however, in the way of more efficient lighting. These channels are remote from light-house headquarters, so that often buoys and aids to navigation are gotten out of place, remaining as a snare to navigation for a long time before they are relocated.

"Our trip was necessarily a hurried one and laborious in many ways, but was rendered very agreeable by the general welcome extended to us everywhere. While many improvements are required our examination would lead to the conclusion that in some cases improvements have been undertaken on the Pacific coast without sufficient discrimination, so that less important projects have received large appropriations, to the disadvantage of others more important and more practicable.

"The prominence of the arid lands problem was impressed upon us by the trip. At the same time under present conditions the quantity of arid land which can be made valuable for cultivation is much smaller than is popularly supposed. The value of irrigated portions would consist in the extreme productiveness and in their proximity to mining and other localities where cultivated land is very scarce.

"We all returned with the pleasantest impressions of the Pacific coast, and I trust with an amount of information which will be of very great assistance in framing a bill next winter."

STEEL SHIP BUILDING AT HALIFAX.

Mr. G. S. Campbell, president of the board of trade of Halifax, writing to the Review regarding the proposed steel ship building plant at that point, says:

"While the situation as regards steel ship building here looks promising, nothing very definite has yet been settled. The present position is this: The city of Halifax has offered to grant a bonus of $200,000 under certain conditions, provided the plant is established within the city limits. The town of Dartmouth, on the opposite side of the harbor, has offered a bonus of $100,000 provided the yard is located over there. The various boards of trade throughout the province have urged our local government to grant substantial aid to the enterprise, and the premier has stated that the policy of the government on the question will be announced in a short time. I should judge from the tenor of his remarks that the government intends to do something to start the industry. The Dominion government has not yet been approached by us, but it is hoped they may be induced to grant a bounty on tonnage launched during a term of years. An effort is being made here to float a local company, but it is yet too soon to say with what success. The committee appointed by the city council and board of trade are also trying to interest ship builders in the project, and we hope that some responsible concern may be induced to take the matter up and inaugurate the industry here on a large scale. If the undertaking is properly managed we see no reason why it should not succeed."

LAKE FREIGHT SITUATION.

Prospects of a very heavy fall movement of grain from Duluth and some increase shortly in the shipments from Chicago are still upholding the lake freight market. The general outlook, notwithstanding the strike of steel workers, is better from the vessel owner's standpoint than it was about the first of the month, as the time for grain shipments is nearer to hand and the ore and coal trades are still supporting the opening rates of the season. Delay to vessels in the ore trade is so general at Lake Erie ports that it is a leading factor in supporting freights, and it would now seem that the grain movement may begin before the ore shippers are as well taken care of as they thought they would be a couple of weeks ago. The northwestern grain shippers evidently take that view of the situation, as they are still chartering on a large scale vessel capacity for the closing months of the season at 3 and 3¼ cents, which is much better than the present ore rate. Coal shipments to Lake Michigan are very much behind requirements, but shippers of soft coal are still putting up determined opposition to advanced rates. A prolonged struggle with labor in the steel industry may change the entire freight situation, but otherwise it would seem that the grain movement will result in fairly profitable fall carrying charges and probably some very high rates on coal to Lake Michigan.

AMERICAN BOILER MANUFACTURERS ASSOCIATION.

Officers of the American Boiler Manufacturers Association for the coming year, elected just previous to the close of the annual convention in Buffalo on Wednesday last, are as follows: President, Richard Hammond, Buffalo; secretary J. D. Farasay, Cleveland; treasurer, Jos. Wangler, St. Louis; first vice-president, John O'Brien, St. Louis; second vice-president, R. Munroe, Pittsburg; third vice-president, Samuel Borger, Columbus, O.; fourth vice-president, J. M. Robinson, Boston; fifth vice-president, M. F. Cole, Newnan, Ga.

Atlantic City, N. J., was selected as the place of the next meeting, the date to be left to the discretion of the local committee.

A very interesting paper read at one of the closing sessions was by H. J. Hartley, ex-president of the association. It dealt with reminiscences of old-time methods of boiler construction and in some parts was quite humorous.

IRON MOUNTAIN RAILROAD.

AN OLD HANDBILL WHICH RECALLS THE FIRST STEAM RAILROAD EVER CONSTRUCTED IN THE UPPER MICHIGAN PENINSULA.

The old handbill of the Iron Mountain Railroad Co. which is printed herewith will recall the early days of iron mining in the upper Michigan peninsula to many iron mining and vesselmen who are alive today, for the mines and railways of the peninsula have scarcely more than passed their fiftieth birthday. The Iron Mountain railroad ran from the Cleveland and Jackson mines to Marquette, a distance of about fourteen miles. It was the first steam railroad in the peninsula. On Nov. 11, 1851, Herman P. Ely of Cleveland entered into an agreement with the Cleveland Iron Mining Co. and the Jackson Iron Mining Co. to construct a railroad to the mines on condition that he received the carrying trade of both companies at certain reasonable rates of toll. The companies agreed to pay $1 per ton for the transportation of ore over the road during the first two years, and 50 cents thereafter until the amount should equal an annual total of 70,000 tons, when a graded rate gradually diminishing to 30 cents per ton should obtain. At that time there was not even a decent wagon road to the mines. Ore could only be hauled during the winter time when sleighs might be employed, and $3 per ton was the usual tariff for hauling it from the mines to the shore of the lake. The agreement with Ely regarding freight charges, however, never really went into effect. He did

IRON MOUNTAIN RAILROAD!

GENERAL REGULATIONS!

All freight received for transportation must be accompa-

nied with a memorandum to be signed by the owner, or consigner, giving description of articles, consignment, weight and the Railroad charges to be collected upon delivery according to the freight tariff. Blanks for this purpose will be furnished by the Company. Upon delivery a receipt must be given by the Consignee.

Freight in packages must be distinctly marked with the name of the consignee and place of delivery.

Property shipped in bulk must be loaded and unloaded by the owner or consignee. Cars so loaded must be unloaded and delivered upon the Company's track within six working hours after arrival at their place of destination. TEN DOLLARS will be charged for every 24 hours detention thereafter.

The Company is not responsible for damages occasioned by unavoidable delays, nor for damages from frost or heat to articles affected thereby, nor for articles not suitably packed for transportation.

GUNPOWDER, FRICTION MATCHES,

And combustibles generally, will not be received in the Company's buildings, nor transported except unders pecial contract.

The Company will not become responsible for the transmission of money or valuable papers, manufactures of gold and silver jewelry and the like. None of its agents are authorized to take charge of or receive compensation for carrying property of this description.

Claims for damages upon property transported must be made and settled before its removal by the owner or consignee.

Property for transportation from the way stations where Depot buildings have not been established, is at the owner's risk until received on the cars, and property transported to such stations is at the owner's risk after delivery from the cars.

All standing freight accounts are to be settled weekly.

No trains will be run on Sunday.

FREIGHT TARIFF.

Until further notice this Company will carry freight at the following rates:

GOING EAST.

Iron and iron ore, from Pioneer Furnace and Jackson Mountain to Marquette,	70cts per. ton of 2000 lbs.
From Cleveland Mountain to Marquette,	75cts " " "
From Lake Superior Mountain to Marquette,	77 1-2cts " " "

The cars to be loaded and unloaded by the owners or consignees of the property, and to be delivered upon this Company's track, as provided in the general regulations. For all other freight double the above rates will be charged.

Going West.

For all freight, excepting articles specified below from Marquette to Franklin,	5 cents per 100 lbs.
From Marquette to Duncans Mills,	8 " " "
" " Pioneer Furnace and Jackson Mountain,	9 " " "
" " Cleveland Mountain,	10 " " "
" " Lake Superior Mountain,	11 " " "

For empty barrels, boxes, feathers and the like, double the above rates will be charged. Brick, stone, lime and the like in quantities of 8 tons and upwards, loaded and unloaded by the owners, will be taken at half the above rates. Smaller quantities at a reduction of 25 per cent from the above rates.—Bricks are reckoned at 4 lbs. each, and stone at 36 lbs. per cubic yard

not begin the construction of the railroad as soon as he had agreed, and the Cleveland and Jackson companies, becoming vexed at the delay, undertook the construction of a plank road from the lake to the mines. Late in the fall of 1853 they decided to convert the plank road into a strap railroad and gave the order for the necessary rails in the spring of 1854. The strap railroad had meanwhile been dignified with the name of the Iron Mountain Plank & Railroad Co. It was finished to the mines in the fall of 1855 and its name changed to the Iron Mountain Railway Co. Its power was, of course, horses and mules; its cars had a capacity of four tons each. The grades upon this strap rail road were frightful and it was not an unusual circumstance for a car to run away on the down grade and jump the track after wounding the horses badly. Herman P. Ely had been meanwhile projecting his railroad, which he called the Iron Mountain Railroad Co. He was greatly incensed at the Cleveland and Jackson companies for building a strap railroad and took out injunction after injunction, none of which were permanent. In the fall of 1856 Herman P. Ely died at Marquette and his brother Samuel P. Ely, who died only a short time ago in Paris, took up the work. He inaugurated a policy of conciliation with the mining companies, and in the summer of 1857, upon the completion of the Iron Mountain railroad to the Jackson mine, the strap railroad was abandoned. The first locomotive placed upon the road weighed 27 tons and was called Sebastopol. This locomotive reached the mines in August, 1857. A second locomotive, known as C. Donkersley, was also placed in commission during the summer and this comprised the motive power for a couple of years.

The rates of toll mentioned in the handbill were not adhered to. The railroad put the price up to $1.09 per ton in 1860 and maintained it at that figure until 1864 when it was advanced to $1.10. The tariff remained at the latter rate until 1870. The extension of the Peninsula division of the Chicago & Northwestern from Escanaba to the mines in 1865 had no appreciable effect upon freight rates.

The Iron Mountain Railroad Co. became known as the Bay de Noquette & Marquette Railroad in 1858, and arrangements were made to extend it further into the country to take advantage of the land grants which congress had just voted to stimulate railroad construction. It was later called the Marquette & Ontonagan, and when the line was extended to Houghton it was called the Marquette, Houghton & Ontonagan. It operated under this name until the Marquette & Western, a branch of the Detroit, Mackinac & Marquette, was constructed from Marquette to the mines in 1882. The Marquette & Western was the first competing line the old Iron Mountain Railroad ever had. Competition did not last long, however, as the Marquette & Western quickly absorbed the Marquette, Houghton & Ontonagan railroad. The next change in its name occurred when it was incorporated into the general system of the Duluth, South Shore & Atlantic. It is by this name that it is at present known. The third railway from Marquette to the mines was constructed in 1896 by the Cleveland-Cliffs and the Pittsburg & Lake Angeline mining companies. This competition reduced freights to 32 cents a ton. It is also significant that after all these years of output the traffic along these roads in the ore shipping season is among the heaviest in the world.

SHIP BUILDING AT PHILADELPHIA AND VICINITY.

Philadelphia, Aug. 19, 1901.—Work is speeding on the two liners, Kroonland and Finland, building at Cramps ship yard for the Red Star line of the International Navigation Co., and both will be afloat before the end of the present year. It is proposed to have the first launched in six weeks from date if the present program does not miscarry. They are the largest and fastest vessels ever constructed for the Red Star service. Longer by 26 ft. than the speedier St. Louis and St. Paul and greater by 400 tons, they will offer a service in no way inferior to those express steamships except in speed. They will measure 580 ft. between perpendiculars, with a beam of 70 ft. and draught of 30 ft. They are of 12,000 tons register. They are to be of the twin screw type, equipped with quadruple expansion, direct and surface condensing engines, of the inverted vertical type, arranged so as to produce a minimum of vibration and with parts so disposed that they are practically balanced to perfection. The vessels will carry passengers on three decks—the promenade, upper and saloon decks—and both first and second-class passengers will find accommodations in the midships section.

A formidable repair job is also under way at Cramps in connection with the liner New York of the American line, which has been undergoing repairs, practically amounting to a rebuilding, during the past three months. The principal part of the undertaking, now under way, is fitting the liner with new boilers and engines, the latter of the triple expansion type and of 20,000 H.P. Two lofty funnels will replace the familiar three stacks. The New York has been conceded a speed of 20 knots an hour, but she will be faster by at least a knot, following the extensive improvements. In the deck arrangements several important changes are being made. On the promenade deck several staterooms are being added in the space occupied by the center funnel, which has been removed. On the saloon deck, however, the greatest change will be noticed in the remodeling of the ship's interior. The second cabin dining saloon, formerly located amidships, is now shifted far astern and its former position will be filled with finely appointed suites. On the main deck minor changes are to be made in the arrangements immediately abaft of the funnels. James A. Wright, second vice-president of the American line, said that the company was so pleased with the reconstructed Paris, now renamed Philadelphia, that they desired to have the New York made as near like her as possible.

The battleship Maine, which was towed down to the League Island dry dock to have her bottom scraped and painted, has been returned to the ship yard. So far no armor plate has been received by the builders for this vessel, and there is every indication that her construction will be retarded, causing a repetition of the Alabama incident in this connection, against which latter vessel the Cramps have entered a bill in excess of $200,000 for the delay occasioned them. The reports circulated that the Maine was found to be leaking after her launch, necessitating the docking, are pronounced by the builders to be without the slightest foundation.

Edwin S. Cramp, superintending engineer of Cramps, when questioned regarding the effect of the steel strike on ship building, said: "So far as I am able to learn it will have no material effect. The eastern yards get the bulk of their plate and shapes from the Homestead plant of the Carnegie Co., from the Pennsylvania Steel Co. and from the Bethlehem Steel Co. These are not involved in the trouble and there seems to be little probability that their regular supply of material will be curtailed. So far as I know the various ship builders are not alarmed over a possible lack of material." In this connection local ship builders deny that orders for plate and shapes are being given with a view of stocking up for a possible general strike.

The Neafie & Levy Co. and the New York Ship Building Co. report that they have an abundance of material on hand for the contracts now under way and do not expect any serious embarrassment. Both of these latter concerns have had far less trouble this season in securing shapes than during 1900.

The Dutch steamship Ambon has been chartered to proceed to Philadelphia to load a cargo of steel rails for the railroads of Java. The cargo is the output of the Homestead mills and weighs 4,000 tons. Great interest attaches here to this sailing, as it is said to be the first of the kind from a United States port to that country. The vessel was fixed for a September loading, which will be performed at the Kensington piers.

John Mills, the Cooper's Point (Camden) ship builder, will make a final attempt this week to raise the British steamship Bermuda, which has been sunk at Vine street wharf since Aug. 15, 1900. Since that time the wreckers have never ceased their efforts on the vessel. She foundered a few hours after arriving from Jamaica with a cargo of fruit and the cause has ever been a mystery. The divers sent down discovered a ragged hole near the stern, and it was admitted that an explosion had been overheard. The most plausible explanation is that the donkey boiler exploded. In the long series of attempts to float the steamship every appliance suggested by the long experience of Mr. Mills has been employed. The final attempt will be made by air bags. Some forty of these contrivances, each measuring 10 ft. long by 8 ft. in diameter, have been placed in position in the hold. When all is ready on Thursday they will be inflated, and it is hoped that, aided by submerged pontoons, they will bring the Bermuda to the surface. It is understood that Mr. Mills contracted to raise the vessel for $6,000, the sum to include the subsequent repairs. At least $10,000 has already been expended in fruitless efforts.

Five-masted schooner now building in the yards of McKay & Dix, Verone, Me., will be launched about Nov. 1.

MR. CHARLES M. SCHWAB ON UNIONISM.

When Charles M. Schwab, president of the United States Steel Corporation, was a witness before the industrial commission in May last he was closely questioned by the members of the commission with regard to the possible attitude of the corporation in just such an emergency as now confronts it. A corrected proof of his testimony has been received by the commission from Mr. Schwab. In reply to a question by Commissioner Farquhar, Mr. Schwab said:

"This is what I say after a careful study of the whole situation: that if I were a workingman—as I was—if I was a workingman now in one of these mills, especially if managed under the broad policy under which I hope the steel manufacture is administered, I would not want to belong to a labor organization. It puts all men, no matter what their ability, on exactly the same level.

"If I were a better workman—quicker, smarter—than the other man, I would want to reap the benefit. I would not want to be put in the same class as the poorer man, which they must do.

"If we have 500 men employed at the same class of labor the wages paid will be the same—must be the same paid to the same class. The level is that of the poorest man in that department. As a workingman, I would not advance and I would not be able to show a superior ability over any other, if I were in an organization. That is my personal view."

Mr. Litchman asked him: "Are you not likely to have an acquaintance with organized labor in the immediate future?"

"Quite probable," he replied, "but still, I do not think I shall. I think that will fall to the lot of the presidents of the subsidiary concerns."

In referring to the labor troubles at the Carnegie plant, Mr. Schwab said he found the rules of the organization limited the output of the individual men to a detrimental effect. "In speaking before the British Iron & Steel Institute a few years ago, I said I thought one of the chief reasons why England could not compete with America was because of the unreasonableness of their organized labor, primarily. I remember a comparison at that time showed that the output of the same machines there was only about one-third what it was in America."

This lessening of the output Mr. Schwab ascribed to the rules of the union. Later on he said: "It has never been so much a question of wages with any of the workingmen's organizations. That has been clearly demonstrated in the statement I made with reference to our earnings when we had the fixing of wages. I think that is sufficient proof of that statement. It has not always been a question of wages. It has, unfortunately, been a question of management and the operation of our works. I do not know how you are going to fix that. It is a serious question that confronts workingmen as it confronts those who treat with them."

In speaking of the Carnegie Co. Mr. Schwab said: "Up to 1892 we had labor organizations. Since 1892 we have had none. I would like to call attention to that remarkable fact. When I say none, I mean of our steel workers. It is true we have some labor organizations on ore docks, but they are of small moment. There are always exceptions in great questions, and they are mainly exceptions.

"Now we have no labor organizations at our steel works, and as a result of that we have been able to pay greater wages on the average but not as high wages to certain men who occupied high positions in which the wages were fixed by the labor organizations which we thought unjust."

Mr. Schwab evaded a question as to the power which consolidation conferred on a corporation to crush a strike by blacklisting employes, but answered this one: "But does not the corporation add very much to the power of an employer as a whole as against any particular class of employes?" His reply was: "I think it does."

WASTAGE OF SEA-GOING VESSELS.

"What is the annual wastage in connection with the shipping of the world? Approximate facts and figures compiled by Lloyd's enable a fairly accurate estimate to be formed as to the extent to which the shipping registers of the various maritime countries suffer year by year from accidents and other causes The total number of vessels lost during the last quarter of 1900 were 224, representing a tonnage of 171,996, and classified as under:

	No.	Tonnage.
Abandoned at sea	19	10,661
Broken up, condemned, etc.	28	24,754
Burned	10	18,807
Collision	13	10,199
Foundered	8	7,137
Lost, etc.	5	1,815
Missing	15	13,545
Wrecked	126	85,078

"Out of the total tonnage reported as lost—171,996—the share of the United Kingdom came to 61,715 tons. Norway is second with 24,704 tons, closely followed by Italy with 21,287 tons. The United States is fourth with 13,617 tons. But the losses of none of the other countries exceeded 10,000 tons. Taking the figures of the quarter as representative of those applicable to the other portions of the year, it follows that the wastage in 1900 over the whole world amounted to close on 700,000 tons," says the Glasgow Herald. "The British loss would thus be about 250,000 tons, and those of Norway, Italy and America respectively 100,000, 84,000 and 55,000 tons. It has to be remembered, however, that the total tonnage owned in the United Kingdom is upwards of 13,000,000, as compared with 1,640,000 in Norway, 983,000 in Italy and 2,035,000 in the United States. The proportion of loss, therefore, sustained by the Italian merchant service is much higher than that of any of the other countries mentioned. Taking all the maritime powers, the percentages of losses in vessels and tonnage stand thus:

Flag.	Vessels.	Tonnage.	Flag.	Vessels.	Tonnage.
British	0.55	0.47	German	0.82	0.36
American	1.13	0.67	Italian	1.36	2.16
Austro-Hungarian	0.37	0.14	Norwegian	1.60	1.51
Danish	0.62	0.15	Russian	0.64	0.49
Dutch	0.99	0.12	Spanish	1.17	1.35
French	0.74	0.64	Swedish	0.91	0.68

SUEZ CANAL STATISTICS.

The British Suez canal directors have reported the navigation through the Suez canal for 1900 as compared with that of the two previous years. The summary of the report at hand is that of John G. Long, consul general at Cairo, and is the first to our knowledge to reach this country. It is unsatisfactory in that it does not give the total net registered tonnage which passed through the canal during 1900. The report says, however, that the net tonnage for 1900 shows a decrease of 157,477 tons as compared with that of 1899, but an increase of 499,549 tons as compared with that of 1898. Access to the figures of 1899 shows the net registered tonnage to have been 9,895,630 tons, which would make for 1900 a tonnage of 9,738,-153 tons. Following is the rest of the summary:

The transit receipts, which in 1899 amounted to 91,318,772 francs ($17,624,230) and were higher than in any previous year since the opening of the canal, fell to 90,623,608 francs ($17,490,356) in 1900, being a decrease of 695,164 francs.

The number of vessels which passed through the canal was 3,503 in 1898, 3,607 in 1899, and 3,441 in 1900, of which 2,295 in 1898, 2,310 in 1899 and 1,935 in 1900 carried the British flag.

There has consequently been a falling off in the tonnage of British vessels, which amounted to 6,297,743 tons in 1898, 6,586,310 tons in 1899, and 5,605,421 tons in 1900. During the same period the tonnage from German vessels has increased from 969,597 tons in 1898 to 1,070,767 in 1899 and 1,466,391 tons in 1900.

Of 2,407 merchant vessels and vessels in ballast, of a net tonnage of 6,612,316 tons, passing through the canal, 1,661 ships, of a net tonnage of 4,705,634 tons, were British, being fully 69 per cent. of the number and fully 71 per cent. of the tonnage; 291, or 12 per cent., were German vessels, whose tonnage was 11.1 per cent. of the whole; France, Holland and Austria-Hungary combined furnishing a total of 11.8 per cent. of the vessels and 9.6 per cent. of the tonnage of the carrying trade to the east through the Suez canal.

In the ten years 1889-1898, the annual net tonnage ranged from 6,783,-187 tons to 9,238,603 tons, and the transit receipts from 66,167,579 francs to 85,294,769 francs ($12,770,343 to $16,461,890). The average of the net tonnage was 7,992,897 tons, and of the transit receipts 75,126,933 francs ($14,489,498), while in 1900 the net tonnage was 9,738,152 tons and the transit receipts amounted to 90,623,608 francs ($17,490,356). The mean net tonnage per vessel also rose from 1,951 tons in 1889 to 2,743 tons in 1899, as against 2,830 tons in 1900.

The mean duration of passage for all vessels navigating the canal amounted to eighteen hours and thirty-two minutes in 1900, as compared with eighteen hours and thirty-eight minutes in 1899. In 1900, the percentage of vessels navigating by night was 91.2 per cent., as against 90.7 per cent. in 1899.

The percentage of vessels drawing less than 23 ft. was 58.9 in 1899, as against 62.4 in 1900, while that of vessels drawing more than 23 ft. was 41.1 in 1899, as compared with 37.6 in 1900.

The maximum draught allowed for vessels passing through the canal is 25 ft. 7 in., and 302 vessels, drawing more than 24 ft. 7 in., used the canal, as compared with 386 in 1899 and 374 in 1898, representing a percentage of 10.7 in 1898, 10.7 in 1899, and 8.8 in 1900. It is hoped that before long the maximum draught allowed will be raised to 26 ft. 3 in.

It may be of interest to remark that in 1890 only thirteen vessels passed through the canal with a beam of 49 ft. 2 in. or more. Since 1895 the number has increased as follows: Forty-two in 1895, sixty-eight in 1896, ninety-two in 1897, 123 in 1898, 159 in 1899, and 212 in 1900.

The number of troops carried through the canal in 1900 amounted to 154,249, as against 108,552 in 1899, being an increase of 29,711 Russian, 28,770 French, 22,634 German, 634 Italian, 587 Japanese, 319 Dutch and 297 Portuguese, against a decrease of 13,238 British, 8,543 Turkish, 7,891 Spanish and 7,583 American troops, as compared with 1899. The number of civilian passengers amounted to 102,415 in 1900, as against 88,616 in the preceding year; while the number of pilgrims, emigrants and convicts was 25,530 in 1900, as compared with 25,179 in 1899.

In the year 1870, 26,758 civil and military passengers were carried through the canal; in 1880 the number rose to 98,900; in 1890, to 282,203, as against 221,348 in 1899.

PROGRESS OF MARINE ENGINEERING.

Mr. James McKechnie read an interesting paper at a recent meeting of British mechanical engineers upon the development of mechanical engineering during the period 1891-1901 and the direct effects resulting from such development, particularly as regards speed of warships and merchant liners, as well as on the reduction of coal consumption. Ten years ago the quantity of coal consumed on long voyages was 1.75 lbs. per H.P. per hour; now it is only about 1.5 lbs. Similarly, while it cost some 10 lbs. of fuel ten years ago to carry one ton of cargo 100 miles, the same work can now be performed with 4 lbs. of coal. When it is remembered that these economies apply not to ocean greyhounds alone, but to all "tramps" of a modern type, some idea can be formed of the great savings which are every day being accomplished. Then take the question of speed. Ten years ago no vessel was driven through the water at a greater rate than 20 knots, but now there are several that can travel as fast as from 22 to 24 knots. Some British torpedo boat destroyers, constructed with turbine motors, have reached the enormous speed of 36 to 37 knots. Going more into details, it is found that while in 1891 there were only eight steamers whose rate exceeded 20 knots, there are now more than fifty on such a list. The vessels between 19 and 19½ have also been doubled. Germany still holds first place with the Deutschland, which is maintaining an average of between 23 and 24 knots, but British liners with speeds of over 20 knots, far outnumber those possessed by any other nation. As for size, only two vessels of over 10,000 tons were in existence ten years ago; now there are more than fifty—some of them being over 13,000 tons. Ten years ago, again, there were only ninety-one vessels which exceeded 5,000 tons register; now there are 505. The Germans are displaying considerable enterprise in the production of large ships, but as yet they possess nothing approaching the British-made Oceanic of 17,274 or the Celtic of 20,880 tons.

The five-masted schooner now building in the yards of H. M. Bean, Camden, Me., will be launched Sept. 3.

AMERICAN INVASION.

THE SECRETARY OF THE LONDON CHAMBER OF COMMERCE LOOKS UPON IT AS A VERY HOPEFUL SIGN.

Mr. Kensic B. Murray, secretary of the London chamber of commerce, contributes an article of undoubted value to the New Liberal Review upon the subject of "American Invasion." He does not take the usual pessimistic view, but says that American enterprise in London is nothing new. He instances the operations of the leading insurance companies, the introduction of typewriting machines and various mechanical appliances. He says that he is strongly of the opinion that the increasing investment of American capital in England will be productive of good rather than harm to the country and that such investments should be encouraged. Mr. Murray defends British commerce against the charge of degeneration and dry rot so frequently leveled at it of late. The faults of omission and commission that can undoubtedly be laid at British doors he attributes to the country's great prosperity and undoubted wealth. He compares the nation to an individual or a firm that has amassed so much profit that only the safest business is worth consideration for the future. He refers to the competition which German enterprise has brought to bear of late years against the so-called conservatism of English trade methods, as a proof of the correctness of English methods. English dealers, he says, refused long credit and other requirements which led to the Germans stepping in and securing the business with the result that after ten or fifteen years of competitive trade of this character Germany has landed herself in a serious commercial crisis. The very banks which fostered and discounted the long credits which English merchants declined to concede have become involved. Production in most branches is most seriously checked and the Germans are learning the practical lesson in the school of adversity that small profits and long credit make bad returns.

"Whatever is best and most remunerative in mining, manufacturing, shipping, supply, concessions, finance, loans or other operations, the entire world over, is brought to London in the first instance," he continues. "This fact is recognized in business circles of all countries, and that is mainly why our American cousins are seeking to have a 'look-in' to a market which is larger, freer and less restricted in all ways than their own."

Mr. Murray then admits that the law of minimum risks and maximum profits contains, if too absolutely and exclusively adhered to, the elements of future national danger, and goes on to call attention "to the difference between English and American methods of business as affecting the national rather than individual interests; for it is clear that the state will survive and flourish which conducts its operations in the interests of the nation rather than of the individual. If this be so, and it be recognized that such a law exists (and few will dispute it), it is clear that the fundamental basis of individualism in trade which prevails and operates in Britain is dangerous, and will not secure the ultimate or continued predominance of British enterprise unless directed from a higher national standpoint than that of profit alone."

He instances six points in which England is in great need of immediate improvement.

First—Education, in which Germany and America have set an example and attained results to which this country still shuts its eyes.

Second—"We are a wasteful nation," says Mr. Murray, "and continued systematic and unproductive expenditure will bring its punishment."

Third—The annual systematic waste of time, money and energy in the parliamentary procedure in regard to private bills. "Only those who have had occasion to take charge of an undertaking requiring statutory powers can have any idea of the extent to which utterly profitless costs and delays are incurred in process of obtaining the necessary powers. There are a large number of enterprises, particularly those of some magnitude—such as railway, water, electric traction or other companies—whose work requires that they should be endowed with parliamentary powers. Here again capital grouped collectively would, under our inexcusably expensive and slow system, be placed at a great disadvantage in comparison with the one-man management of a private syndicate or trust. Either the present costly system will have to be revised or some new and cheaper method of concentrating capital and of obtaining the necessary powers to trade will have to be devised."

Fourth—The intentional restriction of output by British labor. "Fortunately for the progress of mankind," says the writer, "no such rule prevails in America." The orders given to America for bridges in Egypt, India and Burmah, for locomotives, etc., are quoted, and Mr. Murray adds: "It will be interesting to watch how long it will take the trades unions of this country to recognize the disadvantages they are creating for their own members, as well as for their employers and the British nation, by the adoption of this pernicious and indefensible system. The American labor system (i. e. the production of the largest amount per individual worker) is clearly destined to survive the British, and the American nation will benefit by the adoption of that which is economically right, while we shall lose in a corresponding degree."

Fifth—The old-fashioned organization of some of the government departments which is an obstruction to trade. As an example, the electrical industry is taken, "the advent and development of which have been retarded for twenty years, if not crippled forever, by a grandmotherly legislature and rules, framed, it was believed, for the protection from danger of the great public. That result has been attained, but not in the manner intended. It has come about through the still-born condition of an industry strangled and delayed by unnecessary precautions, limitations and procedure. The result has been that a new handicraft of primary importance, not second probably even to steam itself, has been constrained to develop itself abroad, and is only slowly coming into use in this country, particularly as regards power and traction."

Sixth—The necessary provision of cheap land and water carriage Mr. Murray does not say, as perhaps he might, that the pull of the railway magnates in the house of commons amounts to a scandal, but he does say: "Today there is little doubt that the railway companies of this country are, in their own sphere, more powerful than the government and the department which should control them. Nor can there be more doubt that they do not always use that power in the best interests of the trade of the country, their own included. A trade which is overweighted with the maximum charge which the traffic will bear, as the goods traffic of this country practically is, cannot be as profitable nationally as the same trade would be were it handled with a view to encourage its utmost development."

Summing up Mr. Murray says: "Our trade so far has, speaking generally, been built up on a basis which did not contemplate serious competition either on its own, or still less, on improved lines of cost and management. Yet that is the class of competition which is coming with the advent of American capital, system and activity. We have as yet only had the sleepy opposition of protection to surmount. Now we shall have mental and physical activity fully equal to our own, and methods of business perhaps superior to those of ours, which have not been furnished in the school of serious rivalry, to overcome. These modernized methods, moreover, will be freely supported by almost limitless capital, which, having a deeply laid object in view, looks less for an immediate return on outlay than on building the foundation of future business and the ultimate rather than the present accomplishment of the object aimed at."

This system of competition, Mr. Murray thinks, British financiers and merchants will be fully able to meet, and the result will be "the undertaking of greater enterprises by British capital and the successful working of even larger schemes than we have yet been familiar with. The British markets will become greater financial and commercial centers than ever. Venders of all nationalities will know that if they have a really good thing to sell they will secure a higher price and probably quicker payment if they bring it to the city than if they attempt to dispose of it elsewhere. More rich residents will flock to London. Property in town and country will not depreciate in value. More mixed marriages will take place, which will strengthen the mental and physical powers of the British race. The reward for high-class assistance will be greater, and all the other benefits following increasing expenditure will accrue down to the bottom rung of the social fabric, and the balance of trade still further rectified in our favor.

"But the chief benefit, nationally speaking, will, I think, be one of long duration, if not permanency. The stimulus of competition of a superior character will prove invaluable. It will provoke a serious awakening in the highest regions of financial and business activity. The best methods of American management will be studied and probably adopted with alterations suitable to local requirements. American production has been stimulated and brought to its present pitch of perfection by the mental process of surmounting the problem of dear labor. It has accomplished that task victoriously, and converted a disadvantage into a positive benefit. American ingenuity and adaptiveness in labor-saving appliances have converted a dear market into one now approaching cheapness of production. The moral of that victory is that there is no difficulty, physical or social, which mind well applied cannot overcome.

"We have ourselves fought that battle in the past, and have not been conquered. I repeat that I have no anxiety now, and rather welcome the new situation and prospects as supplying a motive power which was perhaps slightly wanting owing to our great prosperity and absence of serious competition. American progress may be attributed wholly to organization, system and hard work. We are familiar with, and at least equally gifted in, those qualities. I have every conviction that we will not permit ourselves to be worsted in their proper employment. But I am also satisfied that the struggle will be a severe one, and before victory and assimilation become wholly ours that, as in other warfare, we shall have to pay the price of leaving numerous and unexpected hostages to fortune."

TO DEVELOP ST. LAWRENCE COMMERCE.

During the past week Messrs. A. B. Wolvin of Duluth, and W. L. Brown of Chicago, together with James H. Hoyt, Robert Wallace and James C. Wallace of Cleveland, visited Montreal at the invitation of the harbor commissioners and discussed the proposition submitted to the commissioners at an earlier date for the development of the commerce of the St. Lawrence system of canals and the diversion to that route to the seaboard of a considerable amount of export freight which now leaves the lakes at Buffalo. As is well known, the Wolvin syndicate proposes to build grain elevators and freight houses at Port Colbourne, where deep-draught lake navigation meets the 14 ft. limit of the Canadian canals, and also at Montreal where the canal system connects with ocean going ships. The connecting link is to be a fleet of canal steamers, built with a view to carrying the greatest amount of cargo that can be floated through the locks. The capacity of the boats would be about 70,000 bushels of corn. The location of the elevators and freight transfer houses at Montreal would be on what is known as Windmill point. It is understood that at this point grain could be elevated from the canal steamer with a minimum of cost, and freight of other kinds could be handled in the same way. The canal fleet is to consist entirely of steamers.

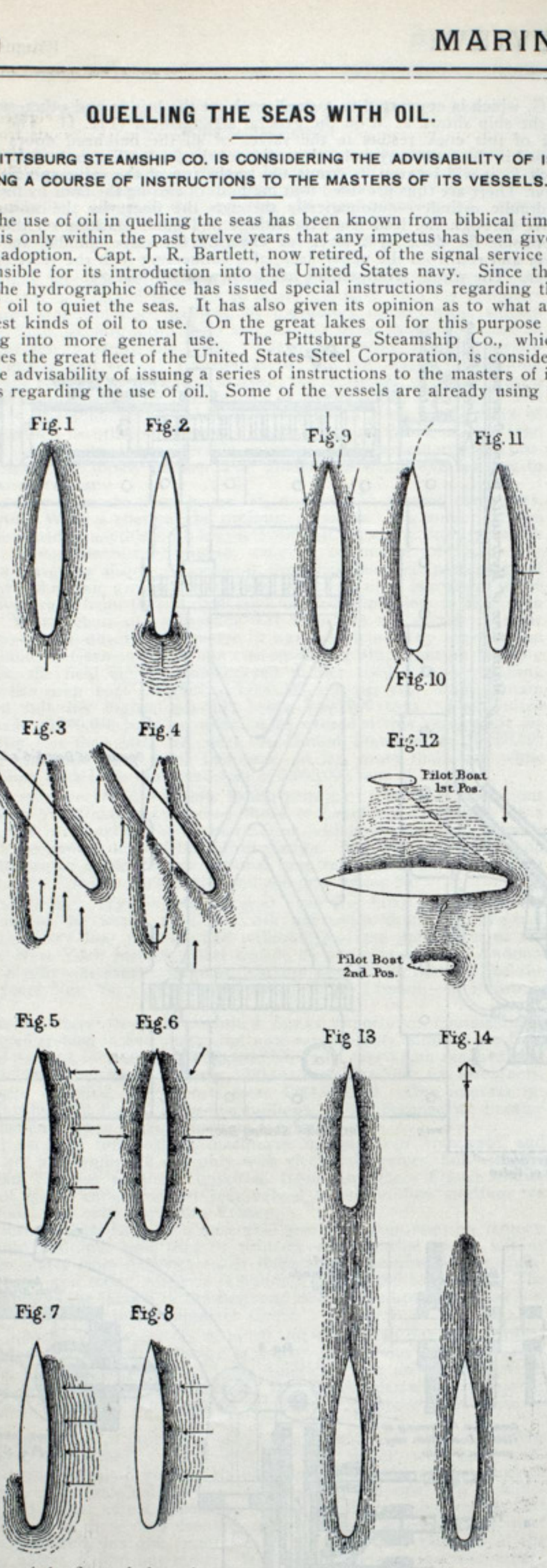
"There is a great deal of freight which could be diverted to this route on its way to the seaboard," said Mr. W. L. Brown. "Grain would be a large item, but pig iron, steel billets, manufactured steel and wire could be sent by this route, as well as a great many other things. There is the problem of a lack of west-bound freight, due to our exports being greater than imports, but nevertheless there is considerable west-bound freight. The syndicate have gone into this enterprise entirely as a business matter. Some of them can get the freight for the St. Lawrence river boats; others have the ability to care for the details of its transportation, and I have gone into it as a ship builder to build the boats. All the money necessary for the work has been pledged."

An elaborate series of overhead trollies has just been erected at the works of the Eastern Ship Building Co., New London. There are three lofty spars about 150 ft. high, each of which supports a cross yard about 200 ft. long and 6 ft. deep. Upon each yard railways are placed which give athwartship motion to a number of rope cables, upon which carriages are operated in a fore and aft direction. The complete structure, weighing some 200 tons, is held in position by a net-work of heavy wire rope guys. This most ingenious arrangement is regarded by mechanical engineers as a great improvement over the usual travelling cranes, inasmuch as eight large members can be handled at any one time instead of the usual one and limit of two.

QUELLING THE SEAS WITH OIL.

THE PITTSBURG STEAMSHIP CO. IS CONSIDERING THE ADVISABILITY OF ISSUING A COURSE OF INSTRUCTIONS TO THE MASTERS OF ITS VESSELS.

The use of oil in quelling the seas has been known from biblical times but it is only within the past twelve years that any impetus has been given to its adoption. Capt. J. R. Bartlett, now retired, of the signal service is responsible for its introduction into the United States navy. Since that time the hydrographic office has issued special instructions regarding the use of oil to quiet the seas. It has also given its opinion as to what are the best kinds of oil to use. On the great lakes oil for this purpose is coming into more general use. The Pittsburg Steamship Co., which operates the great fleet of the United States Steel Corporation, is considering the advisability of issuing a series of instructions to the masters of its vessels regarding the use of oil. Some of the vessels are already using it, as a few of the fleets, before they were merged into the Steel Corporation, were regularly employing it. There is no doubt as to the efficacy of oil, and the wonder is that it is not in more general use. In a rough sea it is of wonderful aid to a steamer with a tow. It does not, of course, prevent the swell but it does prevent the waves from breaking over the tow. It has also quieted a turbulent sea so that when a barge has parted her tow line it has been possible to reach her with a small boat. The Standard Oil Co. is now making a special storm oil and is calling attention to its advantages among the vesselmen.



The following instructions regarding the use of oil are issued by the hydrographic office and are taken from the prize essay submitted to the Hamburg nautical school by Capt. R. Karlowa of the Hamburg-American Steamship Co. In the illustrative figures which accompany this article the flowing lines represent the spreading oil and the arrows denote the direction of the wind and sea:

Scudding before a gale, as shown in fig. 1, distribute oil from the bow by means of oil bags or through waste pipes. It will thus get after and give protection both from quartering and following seas. If only distributed astern, as shown in fig. 2, there will be no protection from the quartering sea.

Running before a gale yawing badly and threatening to broach to, as shown in fig. 3 and 4, oil should be distributed from the bow and from both sides abaft the beam. In fig. 3, for instance, where it is only distributed at the bow the weather quarter is left unprotected when the ship yaws. In fig. 4, however, with oil bags abaft the beam as well as forward, the quarter is protected. Lying to, as shown in fig. 5, a vessel can be brought closer to the wind by using one or two oil bags forward, to windward. With a huge beam sea use oil bags along the weather side at intervals of 40 or 50 ft. In a heavy cross sea, as shown in fig. 6, as in the center of a hurricane, or after the center has passed, oil bags should be hung out at regular intervals along both sides.

Drifting in the trough of a heavy sea, as shown in fig. 7 and 8, use oil from waste pipes forward and bags on weather side as in fig. 8. These answer the purpose very much better than one at weather bow and one at lee quarter, although this has been tried with some success (see fig. 7).

Steaming into a heavy head sea, as shown in fig. 9, use oil through forward closet pipes. Oil bags will be tossed back on deck. Lying to, to tack or wear, as shown in fig. 10, use oil from weather bow. Cracking on with high wind abeam and heavy sea, as shown in fig. 11, use oil from waste pipes, weather bow.

A vessel hove to for a pilot, fig. 12, should distribute oil from the weather side and lee quarter. The pilot boat runs up to windward and lowers a boat which pulls down from leeward, and around the vessel's stern. The pilot boat runs down to leeward, gets out oil bags to windward, and on her lee quarter, and the boat pulls around her stern protected by the oil. The vessels drift to leeward and leave an oil-slick to windward between the two.

Towing another vessel in a heavy sea, oil is of the greatest service and may protect the hawser from breaking. Distribute oil from the towing vessel, forward and on both sides, as shown in fig. 13. If only used aft, the tow alone gets the benefit.

At anchor in open roadstead use oil in bags from jibboom or haul them out ahead of the vessel by means of an endless rope rove through a tail block secured to the anchor chain, as shown in fig. 14.

AROUND THE GREAT LAKES.

J. J. Rardon and others of Chicago have sold the wooden steamer W. P. Ketchum to Samuel Neff and others of Milwaukee; consideration said to be $54,000.

Capt. A. C. Stewart, who has been in the employ of Mitchell & Co. of Cleveland from boyhood, has been appointed master of the steamer Robert L. Fryer. He is only twenty-four years of age.

The first cargo of ore (aside from a sample lot late last season) from the Michipicoten mines in Canada above the Sault was delivered at Cleveland a few days ago, by the steamer Neshoto. It consisted of 2,655 gross tons.

Work has been begun by the Lake Superior Power Co. at Sault Ste. Marie upon an ore dock 1,800 ft. long at the location of the steel plant above the falls. Seven dredges are at work deepening the harbor and approaches to 20 ft.

An expenditure of about $75,000 decided upon some time ago for the West Superior works of the American Ship Building Co. will be devoted to general improvements. The machine shops will receive new tools, and there will be a general lot of repair work all the way through the yards. The old dry dock will receive extensive repairs.

F. B. Wells and F. T. Heffelfinger are the names selected for the two steamers for the Peavey Steamship Co. which are nearing completion at the Chicago works of the American Ship Building Co. The Heffelfinger will be launched Saturday. These two vessels, as well as two others recently completed at the Lorain works are each 450 ft. over all, 50 ft. beam and 28½ ft. depth. They have quadruple expansion engines and water tube boilers, the latter of Babcock & Wilcox type.

Mr. G. W. Cattrell, secretary of the Lumber Carriers' Association, an organization of vessel owners formed to maintain freights, is now located in the Western Reserve building, Cleveland. In a recent circular to members of the association Mr. Cattrell says that the executive officers have reason to feel very much encouraged over the success of their efforts this season. He adds: "At the last meeting of the board of directors the members present were unanimous in their determination to maintain the present rate of $2.50 from ports at the head of Lake Superior, and also to raise the rate to $3 on Sept. 1. There is enough lumber to be moved to insure these rates."

Vessels entering Erie harbor should range in on the red gas buoy No. 2 and the pier head light, keeping about 150 ft. south of a line joining these two lights. This range to be kept until the pier head beacon is reached, then follow the mid-channel between the piers. The line as described is the center line of the 20-ft. channel excavated last year. The old method of standing off the entrance and ranging in on the inner and outer pier head lights is liable to cause vessels to go aground to the south of the channel. Vessels of deep draught leaving the harbor should go well up the bay so as to get well straightened in the inner channel by the time they reach the inner gas buoy No. 8.

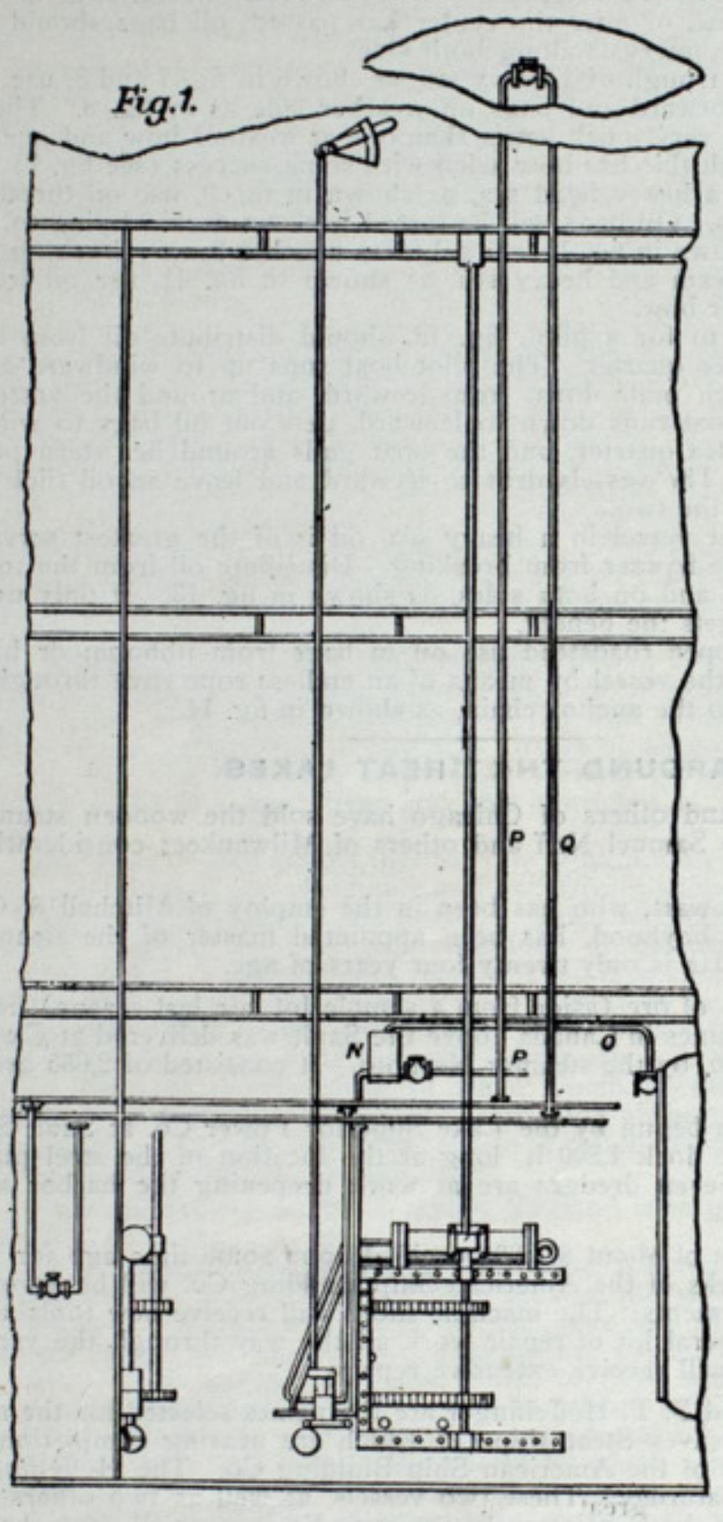
CAMBRIA STEEL CO. NOW CAPITALIZED AT $50,000,000.

The final merger of the property and franchises of the Cambria Steel Co. into the new Conemaugh Steel Co. was made last week when stockholders of both corporations held meetings. The Cambria met first and decided on the merger, and the Conemaugh ratified that action. This brings into existence the new Cambria Steel Co. with a capital of $50,000,000, and, in accordance with the call, the subscribers will pay to Drexel & Co., who are financing the deal, the sum of $11,600,000. It was announced that work on a new plant at Johnstown will be commenced at once. The capital of the new company consists of 1,000,000 shares at $50 each. This money will be used to pay the existing debt of $3,500,000 and $5,500,000 for additional plant, besides other expenses. It is announced unofficially that dividends on the new stock will be paid at the rate of 4 per cent.

MECHANISM FOR CLOSING SHIP'S BULKHEAD DOORS.

Messrs. J. Stone & Co., Deptford, England, have introduced a mechanism for closing ship's bulkhead doors, which is illustrated herewith. The principal feature of the mechanism is that the valve which controls the application of hydraulic power for closing each door may be opened automatically by the lifting of a float, owing to the raising of the water level within the compartment, in the event of there being accidentally made an ingress for the sea; while at the same time the mechanism may be actuated from hydraulic leads controlled by valves on the bridge and other stations in the ship, or by a hand lever on the upper deck or alongside the bulkhead. Fig. 1 shows the general arrangement for longitudinal and athwartship bulkheads, with doors opening vertically in the machinery department of a ship. Fig. 2 illustrates the gearing for a door working horizontally, while Fig. 3 is a section through the controlling valve, with the various connections. As to the general arrangement, N is a steam reservoir with steam pipe O connections from the boilers, so that the doors may be closed by steam as well as by hydraulic power. The hydraulic leads from the pumps are marked P, while those for actuating the valves from various stations in the ship—from the bridge, etc.—are indicated by the letter Q.

Fig. 1.



The valve (Fig. 3) is of the simple central spindle type, the inlet from the pumps being at A, while B is a connection to one end of an hydraulic cylinder placed above the door, and C to the other end. Within the cylinder, shown in Figs. 1 and 2, is a rod with piston at either end; and as the pressure is admitted at one end of the cylinder, the piston rod within the cylinder is driven forward, gearing on the rod engaging in a pinion secured to the vertical shaft. This shaft, thus rotated, closes the door by direct gearing, as shown on Fig. 2, or by bevel gear, if more convenient. Admission of water pressure to the opposite end of the cylinder causes the piston and its geared rod to travel in the opposite direction; thus the door is opened or closed.

To operate the valve by hand, the lever K being raised, depresses the main spindle E, allowing the water pressure to pass through the port to the connection B to the cylinder for opening the door, the water from the other end of the cylinder escaping through the exhaust D. This is the position of the valve shown in section (Fig. 3). By depressing the handle, the spindle is raised and the port to C opened, and that to B connected to the exhaust D; the result being the closing of the bulkhead door.

The action of the float is equally simple. The rise in the water level in the compartment lifting the float, opens the valve H, admitting pressure water from the pump lead at A through ports to the chamber J, forces the valve spindle upwards, and thus admits the pressure through C for actuating the cylinder to close the bulkhead door. Should it happen that, when the door has thus been automatically closed in emergency, someone is left in the compartment, the prisoner can, by depressing the lever K, overcome the effect of the float, thus reopening the door for a sufficient time to insure escape; but the door will again be automatically closed by the float.

The only remaining point to explain is that there is a non-return valve at G, which is connected to a small cock on the bridge and other stations of the ship shown at M on the general arrangement (Fig. 1). The opening of this cock results in the valves of all the bulkhead doors being closed in the same way as by the action of the float. The rod to the upper deck L, it will be seen, is connected to the top of the valve spindle by a lever. There are thus provided four methods of closing the door by the same hydraulic cylinder—automatically through the float; by the non-return valve through the lead from the bridge and other stations on the ship; alongside the door by a lever for lowering the valve spindle, and by a lever and rod from the upper deck, also connecting with the valve spindle lever. The whole arrangement has been well worked out.

Fig. 2.

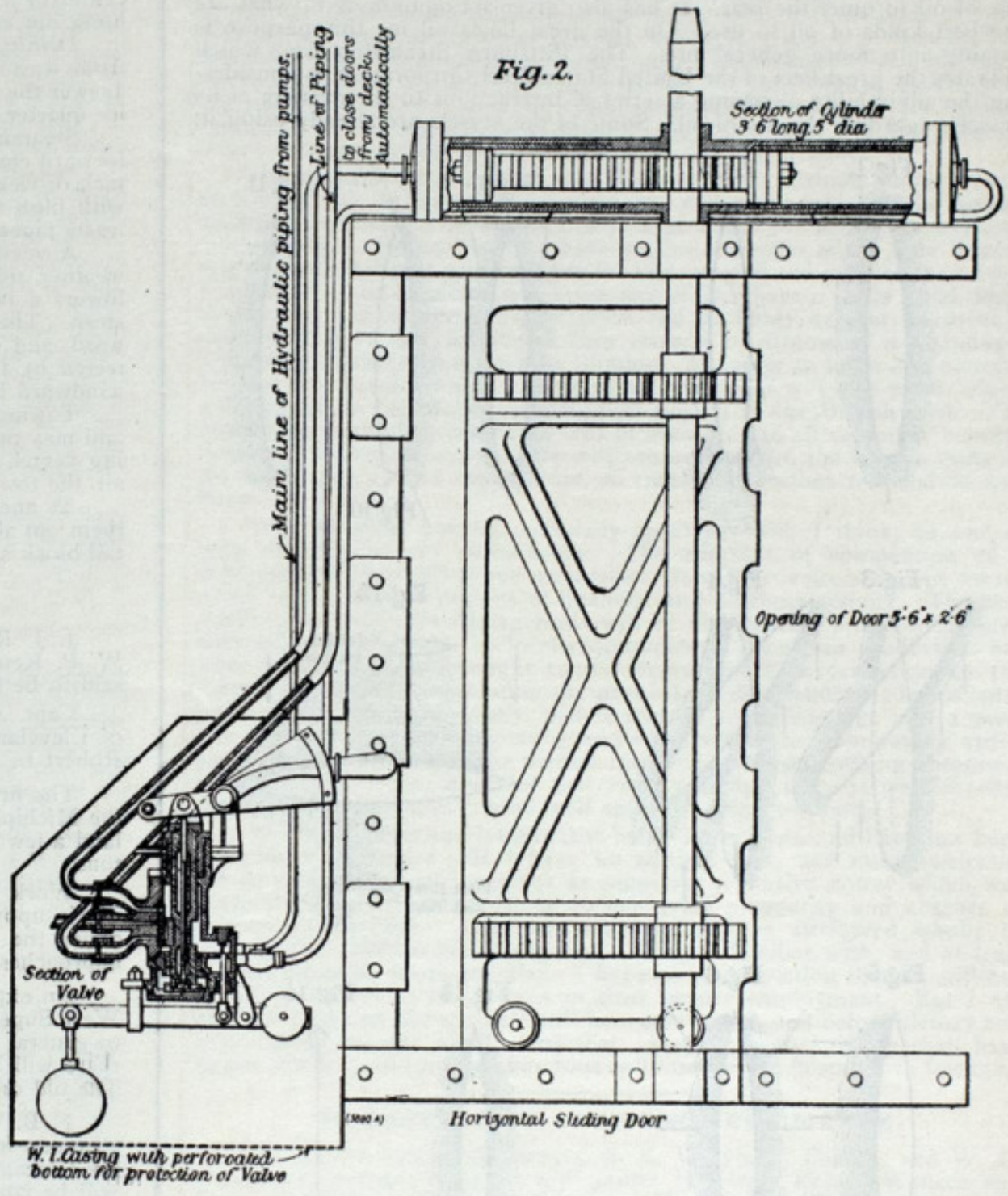


Fig. 3.

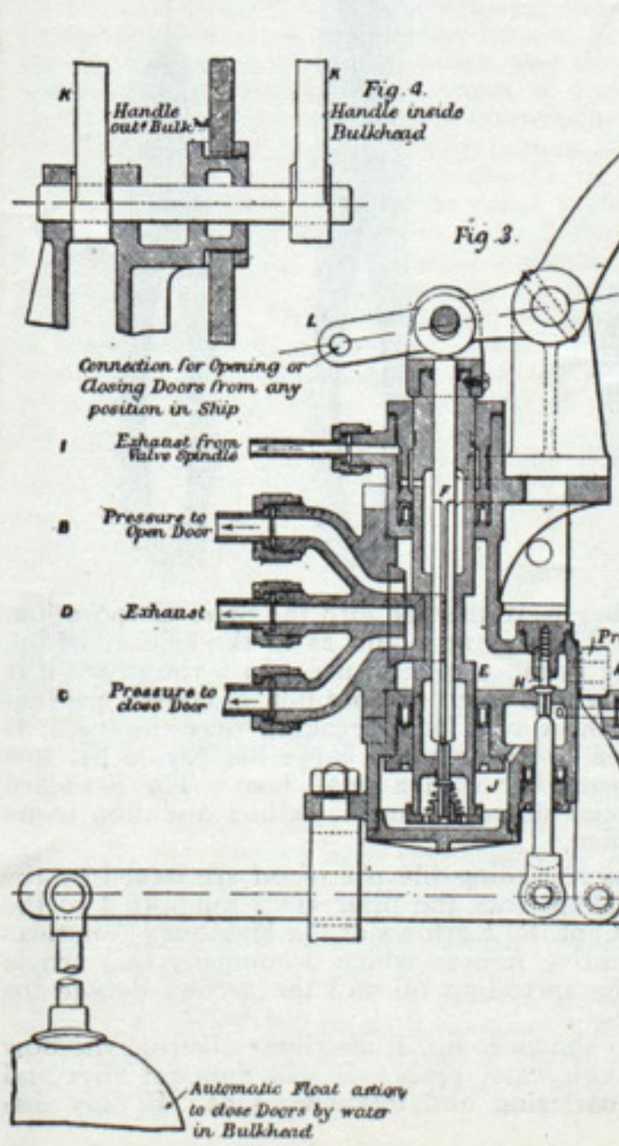


Fig. 4.

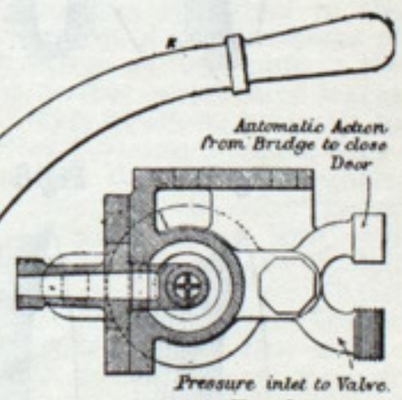


Fig. 5.

BRITAIN AND THE UNITED STATES—MAN FOR MAN.*

BY ANDREW CARNEGIE.

For thirty odd years the writer has been visiting his native land, but never to find such despondency among his friends of the industrial world as this year. Even those are now pessimistic who have hitherto been staunch optimists, sound in the faith that the motherland would "somehow or other muddle through" and brilliantly emerge from threatened disaster, as she often has before in her long, chequered and illustrious history.

It is only fifty-five years since Britain ceased to mine more coal than the rest of the world, and men still in active life have seen her manufacturing more iron and steel, weaving by machinery more cotton, woolen and linen cloth, owning more ships and making more machinery than all others, and first in wealth and credit. The steam engine, bringing steamship navigation and railway transportation; the hot blast and puddling furnace—the roots of modern iron making; the Bessemer, Siemens-Martin and Thomas processes—the foundations of steelmaking; Arkwright and Hargreaves, the founders of machine weaving—all these, and others of like importance in other branches of production, the work of this land alone, no other making considerable contribution to manufacturing progress; Britain, the lonely pioneer who guided the world and led her to modern industrialism.

Turn now from the view backward, and behold present conditions, and, presto! What a change! the optimist exclaims. No longer Britain versus the world in anything, no longer even first among nations in wealth or credit, in manufacturing, mining, weaving, commerce. Primacy lost in all. In sea-going ships still foremost, but even there our percentage of the world's shipping growing less every year. It only increased 46,000 tons in five years, from 1894 to 1899, and was 9,000 tons less in 1898 than in 1896. Worse than all, supremacy lost upon the sea in fast monster steamships—those unequaled cruisers in war, which now fly the German flag, all built in Germany; not one corresponding ship built or building in Britain, the field entirely surrendered to her rival. In ironmaking Germany has risen from 1,500,000 to 7,000,000 tons per year, while Britain has stood still, her highest product being 9,500,000 tons. The United States made 13,500,000 tons last year, to be exceeded this year, while we are making less than last. In steel the United States made 10,638,000 tons last year, and have made this year, so far, more than last, while we are falling back from our maximum of 5,000,000 tons of last year.

Financially we are also rapidly losing primacy. The daily operations of the New York exchange exceed those of London. Our loans at a discount find investors in the United States, which, so long our greatest debtor, is becoming our chief creditor nation. We offer everyone who has confidence to subscribe our national note for £100 if he will give us £93 14s. cash. Consols were at 113, and are now below 95.

We shall not very long be allowed even the boast of having the largest city of the world, as New York has today three and one-half against London's four and one-half millions; and the population of the area now New York increased last decade 95 per cent., while London's increase is only one-fourth as great. At the rate of the increase for the last five years New York in 1910 will almost equal London—in 1915 outstrip her.

While we have stood still United States exports of manufactured articles have trebled in five years, and now reach eighty millions sterling. Our total exports in 1890 were £263,531,800, and never again reached that sum until 1899, when by adding six millions for ships built for foreigners, not hitherto included, the exports were £264,660,000. Our imports increased during that period sixty-five millions, partly because we became more dependent upon foreign nations for food.

Until recently foremost in machinery making, our tramways and subways are now equipped not only with electrical devices, but with the huge steam engines required, imported from America. France shows exports of motor cars, etc., last year valued at one million sterling; we export none, and even buy from France.

The former optimist, now a miserable pessimist, continues his lament. As for ship building, how long is primacy even in that to be left us when ship plates from America reach Belfast and Glasgow by the thousands of tons, and today America is building two 18,000 ton ships? The cable announces the launch of the first, and two others are contracted for, of 20,000 tons, equal to the monster Celtic.

Our industrial army proves as much out of date as our war army is acknowledged to be; our railways at home and in our colonies order their rails, bridges and steel cars from America. Our men either cannot or do not work like the American, as the Times special commissioner has proved, neither do our captains of industry compare with those of America.

Such the choice of morsels from press and magazine upon which the discouraged Briton feeds. Yet, comfort is near, which, with your readers' permission, we shall venture to offer; but before the proper stage of receptivity can be reached by our pessimistic friend one step is indispensable. He must adjust himself to present conditions, and realize that there is no use in these days dwelling upon the past; and especially must he cease measuring his one country with the forty-five countries of the American union, E pluribus unum. It is out of the question to compare 41,000,000 of people upon two islands, 127,000 square miles in area, with over 500 people per square mile (England and Wales) with 77,000,000 upon three and one-half million square miles, unequaled with natural resources, with only thirty people per square mile. Let us proceed, therefore, upon the only reasonable basis, that of man for man, and see what follows, taking up the pessimistic points in order.

First, loss of wealth and credit. Primacy of the world is gone in aggregate wealth only if the pessimist persists in measuring Britain and the American union, which does not approach Great Britain in wealth man for man; with nearly double the population it has only one-fifth more wealth in the aggregate. No other nation is in the race for primacy with Great Britain, even in aggregate wealth. Not much cause for pessimism here, surely.

Even in credit there is only the United States whose credit is better, as shown by the prices of its bonds, but were it to go one-half the distance on the road to financial troubles, which Britain for years has traversed, it is improbable that even she could borrow upon the terms of fast addition to the British debt. Primacy in credit may yet be regained.

In mining, weaving, commerce and manufactures primacy has gone only if the pessimist persists, as before, in measuring Britain against the whole American union. No other nation robs her of primacy in either of these departments, nor is likely to do so. She has still primacy in the aggregate, even against the union, in weaving and foreign commerce, and in exports she is not much behind. Not much cause for discontent here, since against a union of forty-five states she still holds first place in two, and is abreast in another department.

In foreign shipping, it is true, Britain's former huge percentage of the world's shipping declines. How could it be otherwise? But it still exceeds that of any nation twice over. Her lead is so decided that no man living is likely to see it overcome. She had 9,000,000 tons of shipping in 1898; the American union had less than 5,000,000, Germany 1,700,000 and France less than a million. No cause for lying awake o' nights mourning over the position of Britain in shipping.

So with the ship building industry. It is true America is fast increasing and is building monster war and merchant ships, and Germany is also, and that both will prove competitors; but when Britain builds 865,000 tons per year (1898), and America only 249,000, and Germany—although figures are not at hand—certainly much less, probably not half, it is rather premature to take alarm. Britain needs and uses more ships than any other nation, having coal and manufactures to export and bulky food products and raw materials to import. She need not be pushed out of primacy in ship owning, for, not needing to import so much, America is at a disadvantage with Britain, who has better loads for foreign ports throughout the world, out and home for her ships. Therefore, if Britain loses primacy in ship owning, she will well deserve to lose it. In ship building before long it is to be another matter. She must not fall asleep, for America, with her cheap steel and timber and surprising workmen, is finely equipped. Here, if Britain hold supremacy, she will richly deserve the prize.

In ironmaking Germany's fifty-six and one-half millions of people may probably ere long equal Britain's make, as Germany is gaining in population rapidly. But this does not mean any reduction of Great Britain's output; it may even increase somewhat. Her make, man for man, will remain greater than that of any other country except the United States, and not much behind, man for man, a remarkable fact taking conditions into account, showing the little giant that Great Britain is. No other nation compares with her in steel, even in the aggregate. No cause for pessimism here; but an unreasonable man can, of course, easily lament his country's decadence, because it produces five millions instead of ten and one-half millions, which half a continent produces.

We now come to the question, "Is British foreign trade declining?" This has been the subject of much discussion of late, without result; because the question has two parts which disputants usually ignore. Exports are one branch, imports another; the former have decreased per capita, and the latter increased. The two combined show that British foreign trade is not declining. Studying the subject carefully and avoiding the tendency to generalize from temporary causes and values covering only this year or that, the writer is satisfied that the true answer to the question, "Is British trade declining?" is that it cannot be affirmed to be either declining or increasing, imports and exports combined. It has apparently reached its limit, and is not expanding, having remained practically stationary for, say, ten years. It surprises the writer that so much importance is attached in Britain to the monthly statement of exports and imports, as if increase or decrease in these were conclusive proof of prosperity or otherwise. Decreased exports may prove that home consumption is greater—the best of all conditions. Thus the steel exports of America this year will be less than last, because her own demands are greater. Happy country that can use its productive capacity for its own farther development!

Last year was one of great prosperity for British manufactures. Exports of these in many lines declined, but the decrease in quantities of exports was the best proof of prosperity. There is another point often overlooked in considering exports, viz., that these are in the aggregate not to be compared with the amounts consumed at home. It is estimated that only one-eighth of Britain's production is exported. But if we consider only manufactured articles we find that in pig iron 9,000,000 tons are made and only 1,000,000 exported. In coal, less than one-sixth goes abroad; 220,000,000 produced, 36,000,000 tons (average) exported. In textiles, of linen, one-fourth exported, £20,000,000 produced, £5,000,000 exported; in woolen goods, product £50,000,000, £14,000,000 only exported. In cotton goods alone does the amount exported reach the amount consumed at home. The total annual exports average £235,000,000; if we estimate 12 per cent. profit upon these, the gain is £28,000,000.

The backwardness of Britain in electrical machinery and equipment, motor cars, etc., is due to the natural conservatism of the race. The French are more disposed to experiment with novelties and the maker there sees a home demand which is, as just stated, the surest foundation for capturing the foreign market. Britain may still overtake her quicker neighbor—the new plants should soon drive out the latest industrial invader; then exports will begin. It is not always he who starts first who ends first. The writer expects Britain soon to be in the front rank here.

Thus the industrial situation, somber as it is, and dangerous as it might readily become, is not the chief source of danger to Britain today, because, after an awakening more or less rude, and in all respects salutary, it can well be left to work out its own salvation by adopting the changes required both by employer and workman, and which are quite within their power, to enable the country to maintain its trade in competition with others.

*Prepared for an English magazine.

Contract for building the first seven-masted wooden schooner has been given to H. M. Bean, Camden, Me. The owners of the new vessel are Thomas W. Lawson, J. G. Crowley and others. This firm is having a seven-masted steel schooner built at the yards of the Fore River Ship & Engine Co., Quincy, Mass.

Buffalo and return $3.70, via the Nickel Plate road every Tuesday and Saturday. Three-day limit. Inquire of nearest ticket agent or E. A. Akers, C. P. & T. A., 189 Superior street, Cleveland, O. Tel. Main 218.
144 Aug. 31.

MARINE REVIEW

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We are pained to see that the Rev. Washington Gladden of Columbus, of whom we have thought much, has joined the ranks of the calamity howlers. He sees untold dangers to the country in the formation of the United States Steel Corporation and he delivered a thoroughly sensational sermon upon the subject. We will not quarrel with the gentleman, but would advise him to stick to the scriptures in the future. What he says isn't so at all. It probably would be a matter of considerable concern if the vast capital concentrated in that corporation was controlled by unscrupulous men; but the Rev. Mr. Gladden should know that the men at the head of the great corporation are of the utmost integrity. There isn't a speculator among them. They are business men who have managed various independent enterprises in a conservative manner, and who, now that they have merged their interests in one giant corporation, are not going to depart from those strict rules which have served them so well in the past. There is a sense of security to the commonwealth in having a great industry so scrupulously managed. It would be well, indeed, for the country if its great commercial, manufacturing and transportation interests were all as honestly conducted. The Steel Corporation is not unmindful of public opinion. It wants the good opinion of the public and guards it jealously. Resentment of iniquitous demands on the part of a labor union is not to be regarded as hostility to a community. The Steel Corporation is not a tyrannical body. An enlightened man is never a tyrant. But we assure Mr. Gladden that there would be no tyranny more pitiless than the tyranny of the amalgamation were it to succeed in its present demand. There has been tyranny of kings and emperors, of senates and of peoples, but there is no tyranny on record so utterly unreasoning as that which the amalgamation has lately sought to foist.

Activity in ship building is not confined to the lake ship yards nor to the seaboard yards of the United States. It seems to be pretty thoroughly spread throughout the ship building world. Fairplay of London makes the following mention of the stiffening of prices for ships in Great Britain: "A fortnight ago a ship builder offered to construct a high-class cargo steamer of 8,000 tons deadweight for the Atlantic trade for £70,000; last week he advanced his price 2 per cent., and refused to accept the contract under the revised price. In another case, an order for a small steamer was declined last week unless £500 was paid over the estimate given four days previously. A well-known firm of owners recently received tenders for the construction of three steamers, the acceptance of which was to be notified on Saturday. The tenders were not accepted till the following Monday, whereon the builders refused to accept the orders, asking higher prices and offering much later delivery. It is at present extremely difficult to contract for a steamer for delivery before the end of next year, as all, or nearly all, the cargo boat builders are full. It is believed that during the past two months orders for about half a million tons of shipping have been placed. It is maintained by some that the price for building new tonnage will not go lower for at least twelve months, as wages, which absorb the larger portion of the price of a new cargo boat, will not be lowered, owing to the large amount of work in hand."

The Russian hydro-technical congress has recently considered the project of constructing a canal between the Black sea and the Caspian sea. The industrial center of Russia keeps steadily moving southward, owing to development of the naphtha, iron and coal industries. At present the yield of naphtha in that part of the empire amounts to some 400,000,000 poods annually, and that of coal to 600,000,000 poods. The existing railways are even now unable to satisfactorily handle the large traffic and new means of communication are wanted. The projected canal is to have a depth of 22 ft. and a breadth of 150 ft. It is to commence at Astrachan and its terminus is to be at the roads of Taganrog on the Azov sea. The costs are estimated at 40,000,000 roubles.

The new board of directors of the National Tube Co. met in New York this week and elected the following officers: F. J. Hearne, president; William B. Schiller, first vice president; W. L. Latshaw, second vice president; John D. Culbertson, third vice president and secretary and treasurer; A. S. Mathewson, fourth vice president. Mr. Schiller and Mr. Mathewson resigned from the board to permit the election as directors of C. M. Schwab and E. H. Gary. As soon as the necessary steps can be taken to increase the number of directors Mr. Schiller and Mr. Mathewson will go back. The regular quarterly dividend of 1¾ per cent. on the company's preferred stock was declared, payable Oct. 1.

A CENTURY OF STEAM SHIP BUILDING.

THE PRESENT YEAR IS THE HUNDREDTH ANNIVERSARY OF THE ADVENT OF STEAM AS A MOTIVE POWER FOR SHIPS.

From the Monthly Review (England).

The first year of the twentieth century is the hundredth year of steam navigation. It was in 1801 that the first vessel propelled by steam power was built. Her designer was William Symington, her name Charlotte Dundas, and the place of her birth the Forth and Clyde canal, near Glasgow. There the first steamer was employed in towing barges some years before Henry Bell built his famous Comet, or Robert Fulton his equally famous Clermont. The opening year of the twentieth century witnesses the completion of the largest vessel ever built—considerably larger than the Great Eastern, so long the wonder of the world. Between the Charlotte Dundas of 1801 and the Celtic of 1901 there have been one hundred years' development of ship building, of marine engineering and of maritime enterprise, a fair measure of which is obtained by a comparison between these two vessels.

Symington was not, of course, the first to think of or to attempt the propulsion of a ship by steam, but he was the first to achieve it. The Charlotte Dundas was 50 ft. long, 18 ft. broad and 8 ft. deep. Her engine was of 10 H.P. (nominal), and it was of the horizontal type, with a 22-in. cylinder, and a steam pressure of a few pounds per square inch. With this engine the tiny craft was able to make 6 miles an hour, and actually succeeded in towing a couple of barges, seventy tons each, a distance of 20 miles against a strong head wind in six hours. After this achievement the Charlotte Dundas rested from her labors, and her works have followed her. There came, in 1807, Robert Fulton's Clermont on the Hudson river, New York, and in 1811, Henry Bell's Comet on the Clyde, both vessels steaming about five knots. Thirty-seven years after the Charlotte Dundas paddled in the Forth and Clyde canal, the Great Western, of 1,340 tons, and with engines of 750 H. P., successfully steamed across the Atlantic, in spite of the prediction of Dr. Dionysius Lardner that the feat was impossible. She was squickly followed by the Great Britain, the first iron steamer; by the Sirius, British Queen, President and other historic vessels. And in 1840 the Cunard company was formed, and began business with the Britannia, a wooden paddle steamer 207 ft. in length, 34 ft. in breadth, 16 ft. 10 in. in depth, of 1,056 tons, with engines of 740 H.P., with a speed of 8½ knots an hour, and accommodation for ninety passengers. The Britannia was no great advance on the Great Western, and it was the designer of the Great Western, Isambard K. Bunel, who twenty-two years later brought forth that magnificent failure known as the Great Eastern. She was of 18,915 tons, and after her the development was in speed rather than in size until within the last few years.

Now place against the nineteenth-century Charlotte Dundas the twentieth-century Celtic, not the swiftest but the largest vessel in the world. Her displacement is 36,000 tons, or 10,300 tons more than that of the Great Eastern, which vessel she also excels by 1,965 tons in gross measurement. She is even 3,600 tons larger than the mammoth Oceanic, and 200 ft. longer than Lord Goschen's mighty cruisers. She is divided horizontally into nine decks, and can carry a population of 3,194 souls. Her engines are of 14,000 H.P. and her speed will be about 17 knots. In swiftness, however, she will be excelled by the Campania, Lucania, Kaiser Wilhelm der Grosse, Oceanic and Deutschland, but she is essentially a new-century vessel, combining great carrying capacity and comfort, with high, though not excessive speed, so as to provide traveling facilities for the multitude of "persons of ordinary means." Like the railway companies, the steamship companies now gather their profits from the masses, not the classes. The Celtic marks time as an expression of the changed character of transatlantic passenger traffic. Formerly it was confined to the very rich and the very poor; now it is composed of the rank and file of the population of both sides of the Atlantic.

Gigantic as are the sea monsters devised by the modern shipwright, we have not reached the dimensions of the Mannigfual, of Frisian legend, whose masts were so high that a boy sent aloft to "bear a hand," came down a gray-headed man; whose deck was so spacious that the captain had to gallop about on horseback to give his orders, and whose length was so great that when swinging in the channel her stern scraped the cliffs of Albion white, whilst her bowsprit swept the forts at Calais. But we have exceeded in some respects the dimensions of Ptolemy's great ship, which was 420 ft. long, 57 ft. broad, and 72 ft. in depth of hold, and which carried 4,000 rowers and 3,000 marines, besides unnumbered soldiers and passengers. Of the great ship of Hiero, king of Syracuse, the dimensions have not been recorded, but she was at least as large as Ptolemy's, considering that her freightage was "60,000 measures of corn, 10,000 jars of salt fish, 20,000 weight of wool, and of other cargo 20,000 talents, in addition to the provisions required by the crew," and that she was so large no harbor in Sicily could contain her. This problem of harbor accommodation is one that is already troubling the owners of modern steam monsters, and is placing a limit on their growth.

At the beginning of the nineteenth century came into operation the new charter of the East India Co., under which provision was made for the first time for outside merchants to strive for a share of the English trade, which had hitherto been "John's" close monopoly. Under this new charter all British subjects were allowed to export British produce to India, except military stores, ammunition, masts, spars, cordage, pitch, tar and copper, and to import all goods from India, except calicoes and other fine piece goods. All such exports and imports, however, had to be sent by John's vessels at a freight of £5 per ton out, and £15 home. John had some 43,000 tons of shipping in the Indian and China trade, and he was then under the supervision of the board of control. But, although the Indian revenue had grown to £15,000,000 per annum, John's trade was not improving. The exports of the company to India only averaged a million a year, and the monopoly of the Indian Sea traffic had to be abandoned when the charter was again renewed in 1813. Then at last other British ships than John's were allowed into the trade, and soon did three times as much as he did with his lordly and expensive methods. A company that maintained armies and retailed teas, that carried a sword in one hand and a ledger in the other, could hardly expect to be a commercial success, as McCulloch said. In five years after the Indian monopoly was abolished the trade trebled. It is interesting to recall that in the first decade of the century the size of "East Indiamen" had increased

to 1,200 tons and averaged about 800 tons. In 1801 the largest vessel trading between Great Britain and India was a 1,200-ton sailing ship, mounted with twenty or thirty guns, and carrying a crew of 120 men. In 1901 the P. & O. Co. are running several steamers of 8,000 to 10,000 tons. It has been stated that in the early years of the century there was scarcely a shipbuilder in the country who properly understood even the first elements of the displacement of a ship. John Company's vessels then cost £40 per ton to build and equip, though private persons could supply themselves at £25 per ton. A P. & O. liner does not probably cost any more per ton than did one of these wooden East Indiamen; and while John's vessels were fitted up as ships of war, the modern liners are built with a view to use as armed cruisers in time of war. The first year of the century saw the dispatch of some forty vessels, of about 30,000 tons measurement, from London to Calcutta, Madras, Bombay, Ceylon, Penang and China. The last year of the century saw the dispatch of British vessels of 1,175,165 tons to India and 433,233 tons to China, Java and Japan.

The nineteenth century opened (after the brief peace of Amiens) with neutral traders eating into our colonial trade, and with practically all the commerce between the Old World and the New under the American flag. England and France hurled blockading and confiscating orders-in-council against each other, and the Yankee ship sailed in and carried off the prize. The commerce of the world was being carried on at great peril. Professor Leone Levi extracted some notes from the proceedings of the court of admiralty, in illustration of these times:

"An American ship with a cargo of tobacco was sent from America to Vigo, or to a market for sale. At Vigo the tobacco was sold under contract to deliver it at Seville, at the master's risk, and the vessel was going to Seville to deliver the cargo when she was captured. A British vessel was separated from her convoy during a storm, and brought out by a French lugger which came up and told the master to stay by her till the storm moderated, when they would send a boat on board. The lugger continued alongside, sometimes ahead and sometimes astern and sometimes to windward, for three or four hours. But a British frigate coming in sight gave chase to the lugger and captured her, during which time the ship made her escape, rejoined the convoy and came into Poole. Ships were taken because they were sailing to false destinations under false papers, false flags, false certificates of ownership, and false bills of sale. They were seized for running the blockade, and for escaping from blockaded ports. They were arrested for carrying despatches, military men, and contraband of war. In every way, at every point of the ocean, the pursuit was carried on, till the seas were cleared of merchant ships, and the highway of nations, the widest and freest arena for trade, was converted into an amphitheatre for the display of the wildest and worst excesses of human cupidity and passions."

At the beginning of the century, the ship builders of the Tyne and Wear, of the Humber, the Thames and the Mersey, and of the southern ports were turning out wooden vessels of much the same type as their predecessors had built a hundred years before them. Down even to the thirties the average size of merchant ships was not more than 500 tons—those running to 1,000 tons and over in the East India Co.'s service being few in number. There were few more than one hundred feet in length, and there was not a single iron sea-going vessel on Lloyd's Register even as late as 1837, although some iron barges were then in existence. The use of wood for structural material necessarily limited the size of vessels, but when iron was introduced they rapidly grew in dimensions. The first Cunard steamer, Brittannia, was of wood and was only 200 ft. long, but the first iron steamer, Great Britain, was 300 ft. long. It is curious now to recall that although the screw propeller was fitted to the Great Britain, it was not generally adopted for ocean steamers until after 1860, principally because the government would not permit the mails to be carried in screw steamers. This rule held good until 1862, after which the screw was adopted for all sea-going merchant steamers, though not until several years later for warships. The largest vessel afloat in 1861 (barring the Great Eastern) was 360 ft. in length, and in 1870 the longest was 400 ft. Steel was introduced as a ship building material in 1875, and this permitted of a further extension in the size, and also of an increase in the speed of ships. And between 1840 and 1900 the consumption of coal by steamers has been reduced from 9 lbs. to 1½ lbs. per horse power per hour.

Our maritime development has been chiefly during the second half of the century. Till the repeal of the navigation laws we made little progress, and the shipping of America was practically equal to ours. Mr. Ricardo marked the beginning of a new epoch when in 1847 he moved in the house of commons for a select committee to inquire into the operation and policy of these laws. They provided that no goods should be exported from the United Kingdom to any British possession in Asia, Africa or America, or to the Channel Islands except in British ships, though vessels belonging to the United States might carry goods from this country to India. That no goods should be carried from one British possession to another except in British ships. That no goods should be imported into any British possession in any foreign ships except ships of the country producing the goods, and only when such country had colonial possessions in which British vessels were accorded the like privileges or the most-favored-nation treatment. And that no goods should be imported into, nor should any goods (except the produce of the fisheries in British ships) be exported from any of the British possessions in America by sea, from or to any place other than the United Kingdom, or some other of such possessions, except into or from the several ports in such possessions called free ports. The first effect of the repeal of these laws in 1849 was to give a great impetus to American shipping; the next to give a still greater impetus to British ship building in competition with American shipping. The Baltimore clippers sailed in and captured the transatlantic and the Eastern trade until the Aberdeen clippers sprang into the race, and were succeeded by British fleets of the most splendid sailing ships the world has ever seen. With these we steadily worked ahead of the Americans, until the evolution of the iron ship and the screw propeller enabled us to outdistance all competitors and to rise higher and higher in maritime supremacy. But in 1861 the United States had 5,482,127 tons of shipping to our 5,895,369 tons, and that notwithstanding the tremendous impetus given to ship building in Great Britain by the Crimean war. Since then we have not only never looked behind but have never allowed any competitor to come even within sight of us. In 1861 there were only 159 iron and steam vessels of an aggregate tonnage of 68,368 tons built and registered in the United Kingdom. In 1871 the number was 416 and the tonnage 295,109. In 1900 there were 19,986 vessels of 14,032,694 tons on the British register, of which 9,208 were steamers and 10,778 were sailing vessels.

Contrasting with the Britannia in 1840 with a speed of 8½ knots, we have now the Campania and Lucania with a speed of 22 knots, and several other boats with a speed of over 20 knots. Contrasting with the wooden sailing carriers of the opening of the century, ranging from, say, 200 tons to 1,000 tons, we now have the giant cargo boats of the Cunard and White Star lines, ranging from 12,000 to 20,000 tons. In 1811 the first steamer, the Comet, built on the Clyde, was 40 ft. in length, 10½ ft. in breadth and 25 tons burthen, and 4 H.P. Two years later she was followed by the Clyde, a vessel 72 ft. in length and 14 ft. in breadth, with engines of 14 H. P. Two years later still was built on the Clyde the Marjory, 60 ft. in length, memorable as the first steamer to ply on the River Thames. The first steamer to cross the Irish Channel was the Rob Roy, of only 90 tons and 30 H. P., and she is further noteworthy as the inaugurator of the steam service across the English Channel between Dover and Calais. In 1821 was built the first iron sailing ship on the Thames; in 1839 was built the first iron sea-going steamer on the Clyde, and the problem of floating iron was solved. Little did the designers and builders of these vessels think that they were initiating a revolution in maritime commerce, as well as in naval architecture. With 1850 began a period of rapid displacement—the busy little wood ship yards, with their pleasant odor of timber and tar, began to disappear from our seaports, and a new race of gigantic engineering establishments began to spring up in a few well chosen and favorably situated localities. The Clyde and the Tyne soon outdistanced all the rest, and their products drove the Stars and Stripes off the face of the waters.

In the last year of the century the British ship yards turned out 1,245 vessels, of 1,674,844 tons and 1,777,643 H.P., and to the total tonnage the Clyde contributed 492,609 and the Tyne 325,277 tons. This immense total includes not a single sailing ship from the once prolific birthplaces of wooden brigs on the Wear and Tees, only two small sailing craft on the Tyne and four sailing ships on the Clyde. Only on the Thames and the Humber is the building of sailing ships of any dimensions. As the world's output of new vessels in 1900 is estimated by the Statist at 2,321,755 tons, the United Kingdom contributed more than five-eighths of it—not all for British owners and British uses, however. According to Lloyd's returns, the actual addition to the register of the United Kingdom in 1900 was 1,221,533 tons gross, of which only 34,903 tons was in sailing vessels. About 93½ per cent of the addition were new vessels built in the United Kingdom. Against this there were 601 vessels, of 265,937 tons, lost, broken up or for other causes removed from the register, and there were 636 vessels, of 669,118 tons, transferred to foreign and colonial purchasers. At Dec. 31 there were on the register of the United Kingdom 9,208 steamers of 11,786,392 gross tons, 10,778 sailers of 2,246,302 gross tons; total, 19,986 vessels of 14,032,694 gross tons.

Last year there were 1,924 vessels, of 1,019,808 tons, on the registers of the British colonies. Adding these and the natural increase, we may take it that we begin the new century with 15,250,000 tons of shipping with which to do the carrying of the world, while America has 2,750,000 tons, of which, however, 715,000 tons are on the great lakes, and do not enter into the international competition. Germany has 2,650,000 tons, Norway has 1,640,000 tons, France has 1,350,000 tons, and no other country has as much as a million tons. If the twentieth century has to witness the annihilation of our maritime supremacy, it will be pretty far on before our doom is sealed. It has taken us a hundred years to add 13,000,000 tons to our merchant navies, although within ten years we have added more than the entire tonnage of Germany and the United States put together. With our merchant fleets we carry 75 per cent of the sea commerce of the world.

The rate of increase in shipping also has grown as the century advanced. In the last quarter of it our registered shipping increased from 5,750,000 to 14,000,000 tons. It is possible that this pace has been too rapid. At the recent annual meeting of the Chamber of Shipping the president, Colonel Ropner, M. P., expressed the opinion that we are or have been building too many ships. We have also sold a large number of ships to foreigners, besides the new ones we have built for them, and it is really these weedings from the British mercantile navy that form the most serious competition against British ship owners. Col. Ropner indicated his belief that the sailing vessel will probably entirely disappear from ocean traffic during the present century. This is possible; but at the same time one must remember that the sailing vessel is valuable in being a floating warehouse as well as a carrier, and that in commerce cheap storage is often more desirable than speedy delivery.

A big merchant steamer is economical in the amount of cargo she will transport in a few voyages, with proportionate decrease of dock and other charges. The White Star Oceanic of 1871 was 420 ft. long, 41 ft. beam, and 31 ft. deep, and her tonnage was 3,707. She was a single screw ship, with an average speed of fourteen knots, and she consumed about sixty-five tons of coal a day. The Celtic, launched in 1901, has a length of 700 ft., 75 ft. beam, and 49 ft. depth, and her tonnage is 20,900. She is a twin screw ship, and will steam at seventeen knots, consuming about 260 tons of coal a day. The new ship is about 25 per cent faster than the old one, and as a cargo carrier she will carry twelve times as much as the old ship did. In one year the new Celtic will do the work of about fifteen old Oceanics, while the working cost will only be increased about four times. To put it otherwise, the Celtic will carry about four of the first Oceanic's cargoes at the cost of one such cargo carried by the older vessel.

The growth in the size of ships became most marked in the closing years of the century. Ten years ago there was not afloat a single vessel of 10,000 tons; in 1901 there will be twenty-five. In 1892 there were launched in the United Kingdom thirty-seven steamers of over 4,000 tons; in 1900 no fewer than 125 were built. Of the new steamers of over 10,000 tons to be born in the first year of the new century five will be over 18,000 tons each. Who can place a limit on what the new century may see? It is stated by a well-known ship builder that he is ready even now to build a steamer of 50,000 tons if desired. As far as material is concerned the thing is quite practicable, though it may be questioned if it is desirable to place such enormous risks on one bottom. But before further increasing the size of ocean carriers the problem to be solved is how to increase speed without increasing the consumption of coal.

WORK OF THE RAPID UNLOADER.

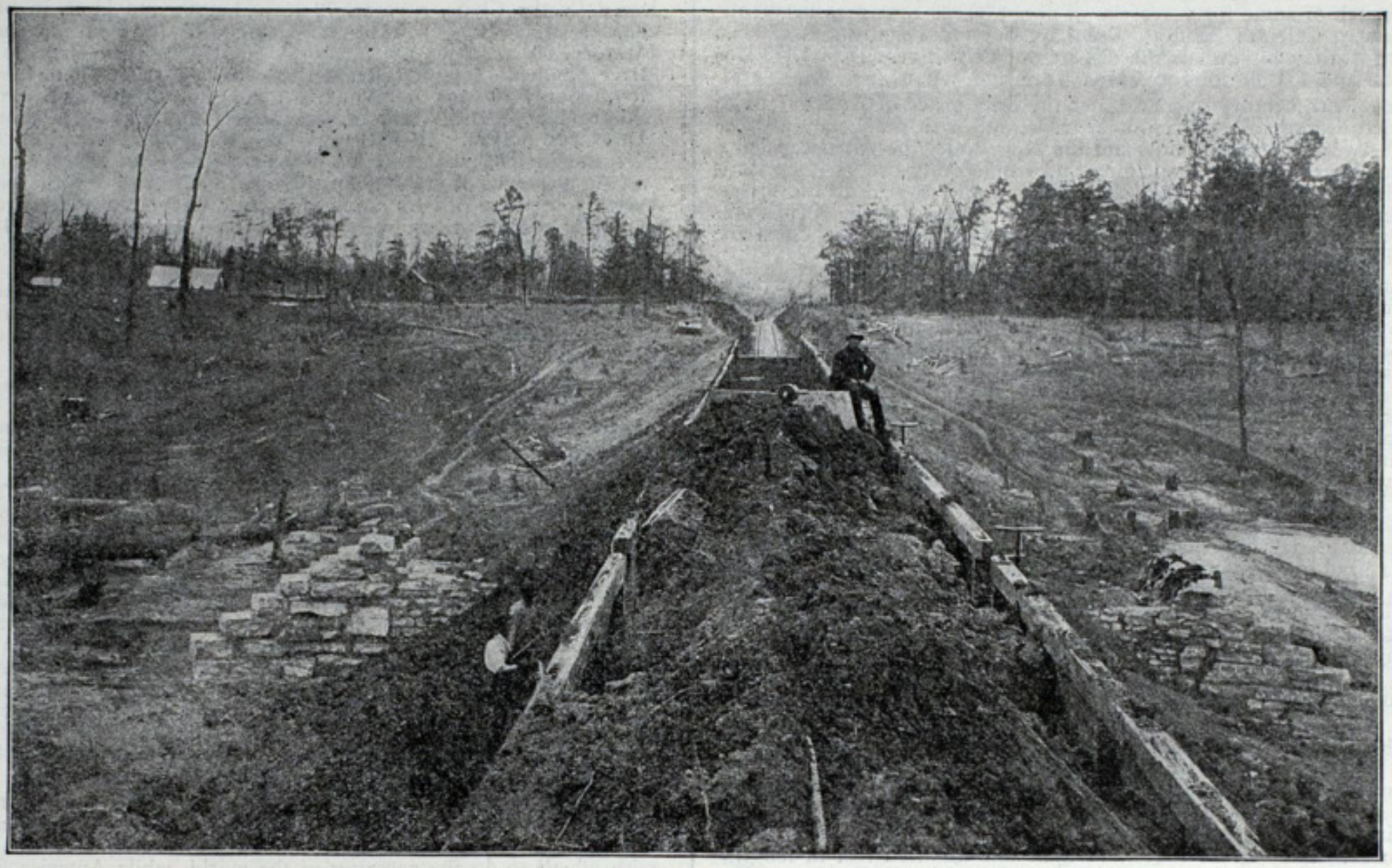
The genius of labor saving through the inventive faculty has probably reached its highest perfection in the great lakes region than in any other part of the globe. Of course, conditions have permitted it, and they have been taken advantage of. The nature of the product to be conveyed has also lent itself to rapid handling. Thus it is not a surprising statement to a lake man that 6,000 tons can be handled by a few men in a few hours. To all else it is incredible. As a race, however, the Americans are labor savers. In the peculiar quality of the adaptation of machinery they lead the world. The Lidgerwood Manufacturing Co., New York, have placed upon the market a rapid unloader which is especially adapted to railroad construction and deserves a high place in the catalogue of labor saving appliances. It is easy to credit the statement of the company that the device with a train of ordinary flat cars handles the dirt from pit to track at a cost lower per cubic yard than any specially contrived dumping car. The cars used for handling the dirt are ordinary flat cars, 39 ft. 8 in. long, and 8 ft. 9 in. wide, with high side boards and outswinging doors. The weight of the cars is 30,000 lbs. and they carry a load of 135,000 lbs. Thus 85 per cent. of the total weight of the car is live load. The cars are but 7 ft. above the rail and permit the steam shovel to work to the greatest advantage. Twelve such cars were loaded in thirty minutes on the Port Arthur route. The cost of filling such cars on the Kansas City Southern railway for four months was 2.89 cents per cubic yard. The only limit to the length of the rapid unloader train is the power of the locomotive to pull the train. Sixteen loaded cars may be considered an average train. Such a train will carry a load of 2,160,000 lbs. By pulling the plow along the train at the rate of 125 ft. per minute the whole train is unloaded in from three to six minutes.

It is difficult to separate the items of cost for unloading from the cost of running the train. Whatever method is employed a locomotive with its engineer, fireman, fuel and water, is required, besides the brakeman. Two men are needed to operate the unloader engine, but the item of fuel must be disregarded because steam for the locomotive is only used for six minutes at a time. One of the contractors, using several unloaders, said that the cost of unloading was too small to be found. Definite figures are to the effect that the total average cost of the work of the steam shovel, filling of cars, haulage of trains and dumping and leveling along the track over a haul of from 5 to 50 miles, was 4.25 cents per cubic yard.

The rapid unloader has special advantages for ballasting railroads. The entire act of stringing the cable, fastening to plow, the train running a mile to point of dumping, the plowing off of the load and the returning to the point of starting requires about twenty minutes. These figures are from an actual test and are of material consequence to a road operating on a single track. The method of making ready to unload is as follows: The cable is wound on a drum when not in use. As soon as the cars are loaded the locomotive usually takes the train to a siding to await orders and while there the cable is unwound from the drum. A simple cheap boom and mast may be used for this purpose.

A leveler is also carried which consists of two wings attached to an ordinary car, and which may be raised and lowered by means of compressed air and folded back against the sides of the car when not in use. The wings spread to a distance of 16 ft. from the center of the track, and are therefore of ample size to dress crowns which are 18 ft. on fills over 15 ft. in depth. The rate of work is about 2,000 ft. in twenty minutes. Heavy soil and gumbo are handled with the same certainty.

The rapid unloader cars may speedily be converted into ordinary freight cars by the addition of sides.



UNLOADING 140 CUBIC YARDS PER MINUTE.

THE PLOW IN AN EMPTY CAR.

SHIP BUILDING AT NEWPORT NEWS.

Newport News, Va., Aug. 21.—The new battleship Illinois, according to the present outlook, will go in commission between Sept. 10 and 15. The date has not been definitely fixed, but it is estimated that the ship will be completed by that time. When Capt. G. A. Converse assumes command, the Illinois will be finished to the smallest detail. The navy department, it is understood, has decided to commission no more warships until they are actually completed, according to contract, so that they will remain at the yards of their builders little if any time after going in commission. Sometimes the recommendations made by officers necessitate changes and consequent delay in finishing up. Capt. Converse, Lieut. Com. Richard Henderson, navigating officer; Lieut. Com. Robert Usher, executive officer, as well as some of the other commissioned, warrant and petty officers are here prepared to take up their quarters on the vessel as soon as she is turned over to the government. The crew is being assembled on the Vermont at New York navy yard and on the Franklin at Norfolk navy yard. All of the crew will be three-year men, so that there will

be very few changes in the crew during the sea service of her officers. From here the battleship will go to Old Point, where a costly silver service will be presented to the namesake of the state of Illinois by its people. A large delegation of people from Chicago and of Chicagoans in Washington is expected to witness the presentation.

Whether or not the naval chiefs finally agree on the merits of the superposed turret system as applied to battleships, there seems to be no question that a large majority of the officers of the line, warrant officers and petty officers favor the double turret. The proposed tests with the battleship Illinois and Alabama and the armored cruiser Brooklyn to determine the comparative efficiency of 13-in. guns mounted in pairs in single turrets, 8-in. guns mounted in pairs in single turrets and a pair of 13-in. guns and a pair of 8-in. guns mounted in superposed turrets will be watched with interest by the naval officers on this station and the officers and men at the ship yard. The early arrival of the battleship Kearsarge in Hampton Roads may have something to do with these tests. It is understood that Capt. Folger's ship will come ahead of the other ships of the squadron. The Alabama is also with the North Atlantic squadron and the Brooklyn is on the Pacific station.

The burned steamer Norfolk-on-the-Roads has been hauled out on a marine railway and this week New York experts are making a survey with a view of rebuilding if possible. It is believed that the hull is sufficiently strong to stand rebuilding.

The coast survey has made Newport News its headquarters for the district of Hampton Roads and Chesapeake Bay and the steamer Endeavor, of the survey's fleet, now makes this her home port. Considerable survey work is being done in the Chesapeake now.

The Trigg ship yard at Richmond, which is building several torpedo boats and destroyers for the government, has hit upon a novel idea for facilitating the repairing of the delicate little warships when they break down during trial trips. It has purchased at Baltimore a floating machine shop which is being overhauled and refitted for its special use. It will be in the neighborhood of the trial course when the boats are out and in the event of mishap, unless of a disabling character, it will not be necessary to put back to the navy yard or to Richmond for the needed attention.

The North German Lloyd liner Main is tied up at one of the piers receiving her machinery, preparatory to leaving for New York, having been floated out of dry dock No. 1.

The cruiser San Francisco, which has been at the navy yard at Norfolk since the close of the Spanish-American war, undergoing extensive overhauling, amounting to a practical remodeling of the vessel, will be placed in commission about Oct. 1. The San Francisco is now a modern cruiser throughout, with a heavier battery than she had before and more comfortable quarters for officers and crew. Her hull protection has been strengthened considerably, and, altogether, she is ahead of any vessel of her class in the navy. When placed in commission, the San Francisco will have been at the navy yard about three years, more time than would be required in building a new ship of her type.

The Seaboard Steel Casting Co., Chester, Pa., are making the anchors for the mammoth steamships building at the yard of the Eastern Ship Building Co., at New London, for the Great Northern Steamship Co. The anchors weigh 60 tons, the largest bower anchors weighing 9 tons each. All are of the Baldt latest stockless type and are of extra quality cast steel.

Special local sleepers.—Train leaving Cleveland at 7:50 p. m. for Chicago, return trip leaving Chicago at 8:35 p. m., via the Nickel Plate road, now carries extra local sleepers between these points affording ample room for all. For specific information call on nearest agent or E. A. Akers, C. P. & T. A., Cleveland, O. 145, Aug. 17.

EXPORTATIONS OF COAL IN 1900.

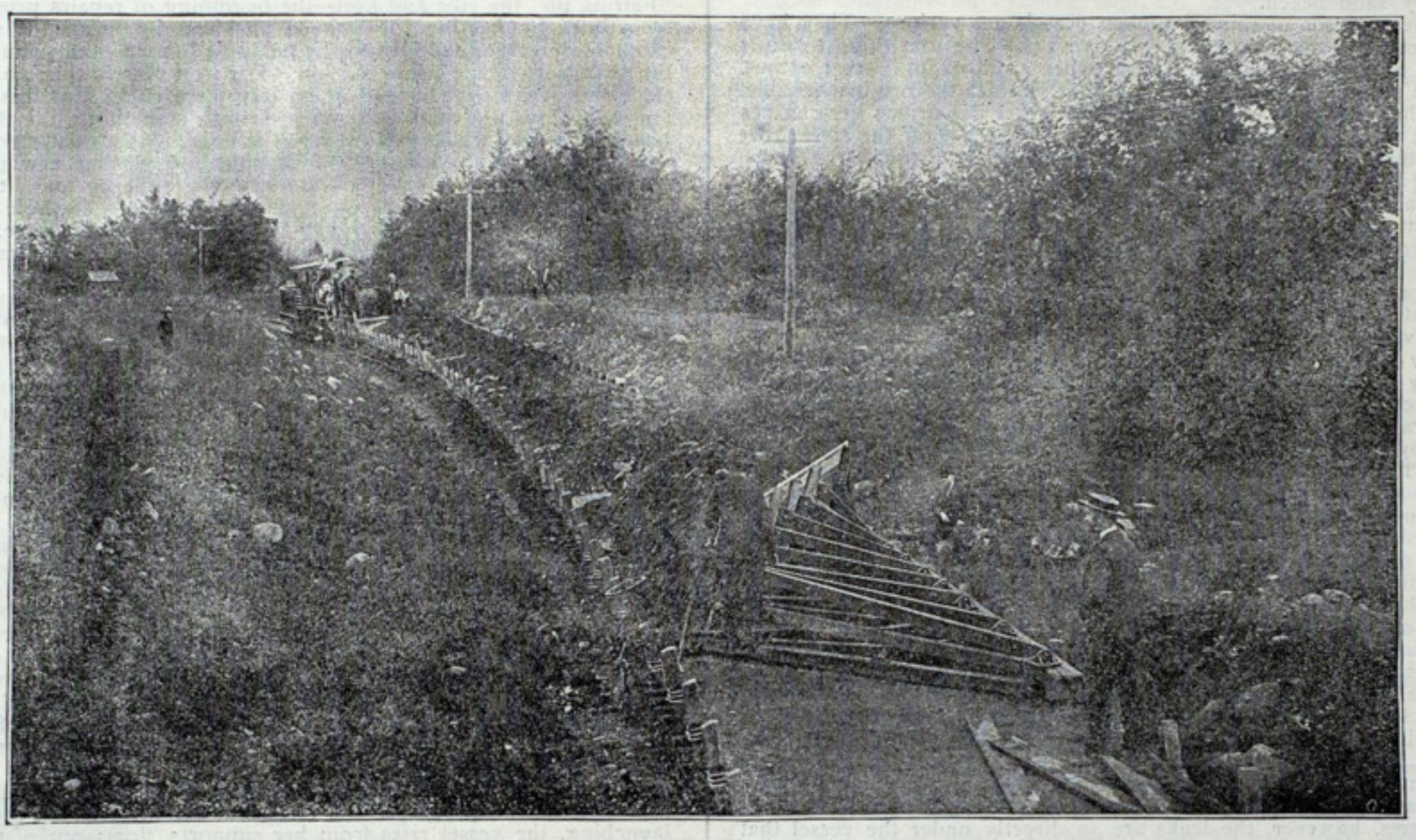
Coal exportations from the United States during the fiscal year just ended, as shown by the treasury bureau of statistics, amounted to $22,317,496, against $19,502,813 in the fiscal year 1900, $13,661,028 in 1899, $11,008,643 in 1897, $10,646,062 in 1896, and $8,391,026 in 1891. Thus the value of coal exportations from the United States has doubled since 1897 and nearly trebled in the decade. These figures relate to values. Measured by quantity the increase has been even greater, the exports in 1901 being 7,676,149 tons, against 2,390,039 tons in 1891, thus making the total exports of 1901 in quantity more than three times as much as in 1891.

The United States now stands third in the list of coal exporting countries of the world. The coal export figures of the principal countries of the world in 1899 show that while Belgium slightly exceeded the United States in the total number of tons exported, her imports were more than one-half as great as her exports, making her net exportation of coal much less than that of the United States. The figures of coal exports during 1900 recently published by the British government, a copy of which has just reached the bureau of statistics, show that the coal exports of the three principal coal-exporting countries—the United States, Germany, and the United Kingdom—in 1900 were: United States, 7,558,000 tons; Germany, 18,055,000 tons; and United Kingdom, 58,405,000. Thus, while the growth of the coal exports from the United States shows a large percentage of increase, these figures of the exportation of coal from Germany and the United Kingdom show that the field occupied by those countries is still much larger than that which the United States now supplies.

In growth of both exports and production, however, the United States had made much more rapid advance than any other country. The total quantity of coal produced in the United Kingdom was, in 1886, 157,518,000 tons; in 1900, 225,181,000 tons; while in the United States the production was, in 1886, 100,664,000, and in 1900, 245,422,000. Thus the United Kingdom since 1886 has increased her production but about 50 per cent., while the United States has increased hers nearly 150 per cent.

The cost of coal has meantime increased much more rapidly in the United Kingdom than in the United States. The value of the 157,000,000 tons of coal mined in the United Kingdom in 1886 is put by the statement of the British government above referred to at £38,000,000, and of the 225,000,000 tons mined in 1900, is put at £121,000,000. Thus, while the quantity mined in the United Kingdom has increased but 50 per cent. from 1886 to 1900, the value has meantime increased over 200 per cent. On the other hand, the value of the 100,000,000 tons of coal mined in the United States in 1886 was, according to the same authority, £32,000,000, and that of the 245,000,000 tons mined in 1900, £67,000,000. Thus, in the United States, while the quantity increased about 150 per cent. the value of the coal mined increased but little over 100 per cent.

The relative increase in the cost of coal in the United Kingdom and the United States is shown in an even more striking form in the statement of the British government above referred to by a table which gives the price per ton of coal in the United Kingdom and United States in 1888 and 1900, respectively. It shows that the price in the United Kingdom advanced from 5 shillings per ton to 10s. 9d., from 1888 to 1900, while in the United States it fell from 6s. to 5s. 5½d. per ton in the same time.



REAR VIEW, LOADED TRAIN WITH PLOW.

The Imperial Dry Dock Co., St. John, N. B., writes to the Review saying that the project for the establishment of a dry dock at St. John is progressing favorably. The company is now arranging for plans and specifications and hopes to be able to ask for tenders for construction within three months.

The Ollard Machine Works, Tacoma, Wash., has been awarded the contract for repairing the machinery of the transport Warren now in that port.

MARINE SURGERY.

HOW WOUNDED STEAMSHIPS ARE MADE WHOLE—THE PROBLEM WHICH WRECK EXPERTS HAD TO FACE IN THE CASE OF HALIFAX.

The steamer Halifax, aground at Fort Warren—with her prow sunk so deep that the water runs in and out of her hawse pipes, as well as through the holes in her bottom, filled so full with baggage and freight as to prevent access to the injured parts from within; buried so deep in sand, possibly, as to cut off approach to them from without—presents a series of engineering difficulties that would tax the ingenuity of the smartest of us, had he never met with the like before. The problems of how to render such wrecks water tight (or partially so), how to float them into dry dock, and how to finally repair and make them as good as new—these have all had to be worked out many times before, and with the exception of the repairing, the solution of them has usually fallen, in this locality, as in the present case, to the Boston Tow Boat Co. We have all read accounts like this before—the striking of the vessel on rocks or collision with other craft, the exciting race, then, with all steam on, funnel snorting and pumps streaming their very best, the gradual settling and careening as the hold fills, till the ship becomes unmanageable, either from her propeller's coming out of water, as in that terrible accident in the Mediterranean, where her majesty's jollies had

"To stand an' be still
To the Birken'ead drill,"

or from her careening so far as to interfere with the action of the rudder, or from having her fires flooded, down in the boiler room; and then the final sinking, sometimes in deep water, sometimes, more fortunately, on some nearby sand beach.

Now the methods of raising sunken vessels are various. They have to be, for vessels come to grief in various ways. The first thing to do is to find out, usually by means of divers, where, and of how great extent, and of what sort the damage is. Sometimes, besides the original trouble, it is found that the vessel in racing for shoal water has driven her engines so hard that their vibrations through the hull have cut off the rivets that join the plates as if with scissors and let the water in through the holes. Sometimes, as the vessel lies, the damaged parts are so high up as to be out of water at low tide. Temporary patchwork is a very simple matter then, but more often—especially in the sunken rock accidents—the source of trouble is not so get-at-able, for it is underneath. Then the cargo must be removed, everything must be done to lighten the vessel. On large floats, pumps are brought alongside, boilers provided to supply them with steam, and with pipes stuck down into the hold, the pumping begins. Divers, meanwhile, groping along the bottom on the outside, discover, by feeling where the water sucks in, where the principal leaks are. If they are but long narrow cracks they drive wooden wedges into them; if they are comparatively small holes pieces of plank with the steamer's own mattresses stuffed under them and, if possible, clamped tightly on by hook bolts stuck out from the inside, will cure the trouble perfectly. The most extraordinary patchwork of this kind was done once on the steamer H. M. Whitney, which was struck by another vessel while in Boston harbor. The prow of the colliding vessel struck the Whitney a slanting blow on one side, cutting through her thin plate (a steel vessel of this type is hardly ever half an inch thick) and turning it back for some 30 ft. just as a knife curls the chip from it on entering wood.

The Whitney sank, of course, immediately. They began the repairs by blowing off, with dynamite, the part which had been torn back. Across the hole, then (working under water all the while) they placed stout timbers, weighting them so they would sink, and securing them to the vessel's side or interior bracings or even to the cargo, by iron hooks, which blacksmiths on the lighters alongside made to order, according as the divers directed. Over that rude framework, cross planks were laid, weighted and secured in the same manner, and outside of all was spread a heavy canvas. When the crevasses around the hole were stuffed with scraps of mattresses the pumps were started and the vessel floated.

Sometimes, however, the leaks are so directly under the vessel that no patchwork methods can be applied, and so large that all the pumps that can be brought into action cannot suck out the water as fast as it runs in. Such was the case of the City of New York, pinned some years ago on the rocks at Point Bonita in the Golden Gate, and the rise and fall of the ocean swell made all such attempts not only fruitless but very disastrous to the wreckers. As a last resort, in such cases, empty casks tightly plugged may be forced into the hold in such numbers as eventually to float the vessel by their own buoyancy; or better still, divers can be sent down inside to the lowest deck that remains intact (a vessel has several decks, of course, just as a house has several stories) and by making its hatches tight, and bracing it from above to withstand the water pressure on the under side, it can be converted into a sort of temporary bottom, just as, for illustration, if our water tight cellar were filled through a window during a flood, we might retreat upstairs and by a judicious stopping of cracks, keep the second floor dry. The poor City of New York was never raised, in spite of all those attempts, but sank lower and lower, till she finally disappeared, masts and all.

In smooth water, however, there always seems to be a way, a one last method that works when the wreckers, watching anxiously the height of the water inside as the pumps thump and throb and the streams pour in white deluges out on deck and flow over the side, to see it begin to drop. Slowly, slowly it goes down; gently the vessel rises from her bed, people in boats meanwhile watching all around her for a chance to stop the influx till the moment arrives for the final dash.

The dry dock has been got ready to receive her, the long line of keel blocks and side props are arranged, according to her shape, and the gate stands open for her to enter. Then come the tugs; good, able tugs, for every minute she is in deep water is a risk. The breakage of a single piece of machinery, the parting of a line, the choking of a pump for but a short time and down she goes again, all the work gone for nothing and to be done over. But, barring mishaps, the procession moves on up the harbor—steamer, lighters, pumps, tugs and all, a regular floating village, whistles blowing to clear the way, and maybe as much as 90,000 gallons, in half a dozen huge streams, in half a dozen directions, flowing out of her every minute as she goes.

There is not room for the whole flotilla in the dry docks, but the pumps must somehow be kept at work on her till she is safely inside, hove directly into position and straightened up, if she be careened to one side, by tackles from her mastheads. Once fair and square where she belongs the pumps may cease allowing her to settle on to her blocks and supports, and the risky part of it is over. As the dock is emptied the stuffing and plugging is removed from her hull, leaving her torn and dented plates exposed for the inspection of the surveyors.

The same general idea of construction is followed in steel vessels as in wooden ones, or even as in small wooden boats. The keel, extending from one end to the other along the bottom, forms the main backbone. The ribs, every 20 in. or so, join to it as the ribs of a fish join its backbone. Over the skeleton thus formed are laid the plates in "strakes," or if you like, "streaks," just as the planks are laid on a boat, only they don't extend the entire length of her, but are jointed neatly, end to end, every 20 ft. or so. From the great number of small pieces composing a steel vessel, it is easy to cut out just what portions have been damaged, and fit new ones in their places, without disturbing the adjacent members.

After each strake has been lettered, beginning at the keel and going up, A, B, C, to the deck, and each plate and each rib is numbered 1, 2, 3, from forward aft, so as to avoid all possible confusion, the surveyors decide what plates and frames shall be repaired, what shall be discarded and replaced by new ones, and then come a swarm of men with hammers and chisels, and the air is straightway filled with the rattle and bang of their hammers and with the flying rivet heads as they knock them off. Once the hopelessly distorted parts are removed the straightening out and alignment of the partially damaged ones begins. Damages to the keel make it necessary sometimes to slack up the rigging and hoist the vessel's masts up bodily and support them on temporary hangings. Clearing away, in fact, often takes as much time as the repair work itself. "Fairing up" the ribs and keel—the beginning of repairs proper—is done sometimes by heating the twisted members by means of portable gas furnaces—enlarged editions of the painter's burner—and pounding or prying them into shape while red hot. For iron vessels this works best; for steel ones it is better to force them into place cold. For this jack screws and crow bars are used, and screw clamps, something like those used in bending railway tracks. However it is done, it is a cumbersome process.

Next comes the question of shaping and placing new parts. First, wooden forms, or "templates" are cut out, built up and fitted into the places from which the old ones were taken—here a whole frame, here only a part of one to be joined to the old stub, there a plate. While the wooden form is in place, the location of each rivet hole is marked on it. It then goes to the shop, where the repairs are being done, and an iron (or steel) shape is bent and cut exactly to fit the wooden form, and holes are punched in it usually by machinery, whenever indicated. The new piece should when placed in the vessel correspond exactly, hole for hole, with what was there before. As a matter of fact, however, a great deal of pulling and hauling, and some considerable vocabulary must be resorted to, to bring it all into position. One thing in particular must be looked out for—in jointing the new parts to the old, care must be taken not to have too many joints in one line. One rib must be spliced down low, the next up high. Plates on one strake must "butt"—that is, join end to end—as far as possible from butts on the adjoining strakes, and oftentimes perfectly good material has to be torn out to accomplish this. When all is in place and bolted temporarily, the jack screws and clamps give room to glowing rivet forges, red-hot rivets begin to be tossed about by black-faced urchins with long tongs, and there starts up a racket from riveting hammers, more deafening than the former sounds of dismemberment.

As fast as the pieces are riveted together the seams are gone over by calkers. Calking a steel hull doesn't consist of wedging soft material into the cracks, as in wooden vessels, but of striking the metal directly beside the seam with a blunt-edged tool, so that it is crowded over on the edge till the seam entirely disappears. Just a coat or two of paint, now, and nobody but the surveyor man can tell where the old vessel leaves off and the new begins. Our ship is as good as new.

Once more the dry dock is filled; but there are no spouting streams now and churning pumps. As calm and confident as on the day of her launching, the vessel rises from her supports, floats out of the gate and turns once more bravely to sea.

Yes, the raising of wrecks comes to be a business after a while, like anything else, but there is no rule and regulation about it for all that. It depends as little on mere knowledge and as much on real ingenuity as keeping friends with one's neighbors. A good wrecker is like a good sailor, a good general or a good fireman—a man who understands the science of getting out of scrapes; and his methods are without end. Take two rather noted cases, for example. A torpedo boat once ran ashore, with the result that she was buckled up in the middle, wrenched out of line and wrinkled like a vagabond tin can. Her repairs were accomplished merely by towing her home, putting her in dry dock, allowing her to sag, by her own weight, into line again, and smoothing out her dents with a little pounding and prying, as easily as if she were an old hat. But another larger, heavier vessel in the same predicament was treated in an entirely different way. She was grounded so firmly that all the tugs in the Clyde (it was near that river that she ran ashore) could not move her. Wise people began to say she never would be floated, but the wreckers knew better. They set to work first to strengthen up the bulkhead which divided her engine and boiler space from the forward hold. This done, they blew the forward portion of her away with dynamite, left her prow hanging to the rocks and towed the rest of her home stern foremost. In the ship yards there they made a new forward section with a temporary partition across its end, and launched it with as much ceremony and champagne as though it had been a whole ship. Placing the old after portion then on a floating dry dock they raised it to the exact required height, floated the new piece up to it, put in the bolts, took out the temporary partition, and all in due time she sailed away as stanch as ever.

We have grown accustomed lately to looking to the scientist, the electrician, the chemist for clever inventions, and not without reason; but out on the frontier, figuratively speaking, the soldier in the field, the railway constructor, the lumberman and especially the wrecker are doing a deal of contriving that never appears in the patent office. Depend upon it, before the Halifax is raised a number of new difficulties will be encountered, a number of ways will be thought out to meet them, and our Yankee inventiveness, if there is any good in practice, will be just so much better than before.—Benjamin Brooks in Boston Evening Transcript.

MR. SCHWAB IS OUT OF BETHLEHEM.

There is no truth in the report from Philadelphia that Charles M. Schwab is to retire from the presidency of the United States Steel Corporation in order to assume charge of the Bethlehem Steel Co. The option which Mr. Schwab obtained upon a majority of the Bethlehem stock, and which expires on Monday next, he does not now own. It was taken off his hands some weeks ago by J. P. Morgan & Co. The history of the deal in this stock as related by a member of a financial house concerned is interesting. For a year or more there has been talk of a ship building combination between the Vickers Sons & Maxim Co. and the Cramps of Philadelphia. Part of the scheme was to acquire the Bethlehem company. Representatives of the Morton Trust Co., who were in charge of the negotiations, are said to have obtained an option on a majority of the Bethlehem stock in June last at $22.50 a share. Later Mr. Schwab stepped in, and bidding $24 a share, secured control of the stock. It was understood at the time that Mr. Schwab was acting in the interests of a syndicate which had been previously formed for the promotion of a ship building combination. The plan, however, fell through and left Mr. Schwab in the anomalous position of being president of the United States Steel Corporation and at the same time holding an option on a majority of stock in a rival concern, which for reasons of business policy could not be absorbed into the Steel Corporation. The Morton Trust Co. and Kuhn, Loeb & Co., agents for Vickers Sons & Maxim, refused to take over the option at the price per share which Mr. Schwab had agreed to pay. When Mr. Morgan returned from Europe arrangements were made, it is understood, for the transfer of Mr. Schwab's contract to a syndicate formed by J. P. Morgan & Co. There the matter now stands. It is probable that some statement as to the future of the Bethlehem company will be made next week. That the United States Steel Corporation will not take over the control of the company is generally admitted.

TO CATCH FISH WITH ARC LIGHTS.

Francis G. Hall, Jr., and Irving A. Burdick of New York, graduates of Yale in the class of 1900, invented while students at the Sheffield Scientific School (Yale) what is known as the Yale submarine arc light. Later the Naval Electric Co. of New York, with which Messrs. Hall and Burdick are connected, was organized, and the lights are being manufactured and applied with marked success to wrecking operations and other submarine work. Now the light is to be tried in deep-sea fishing. Arc lights placed on four specially constructed boats built for W. S. Mead of New York will test the theory in the Pacific Ocean, off the coast of California. Electric lights, it is asserted, not only fascinate big fish, but even blind them long enough to enable strong nets to gather in schools of them. The ultra violet rays given off by electric arc lights stun the fish because of the great dependence they place on their sense of sight.

Four submarine arc lights are to do the work of fishing on each of the boats. Each lamp will be of several thousand candle power. Besides the fishing apparatus each vessel will have a complete electric plant, consisting of a dynamo connected with a new type of petroleum engine, placed near the main engine, this permitting one engineer to run them both; a portable naval searchlight projector, to be used in picking up buoys; six naval portable deck arc lamps for illumination, lamps about the deck-house and hold, and a storage battery to operate the sparking apparatus on all the engines. Wood is the material to be used in the boats because it deadens the noise of machinery and lessens the vibrations due to that. Each vessel will be 75 ft. long, 23 ft. beam and will draw about 6 ft. of water.

ITEMS OF GENERAL INTEREST.

A new schooner which Capt. Harry Gardner is having built at the ship yard of Tarr & James, Essex, Mass., has been named Arkona.

The Eastern Ship Building Co. is now employing about 1,000 men in its ship yard on the two mammoth Pacific steamships. This number, it is stated, will be doubled if the men can be procured.

The torpedo boat Mocassin was launched from the ship yard of Lewis Nixon, Elizabethport, N. J., last week. The Mocassin was one of fourteen torpedo boats purchased from the Holland Torpedo Boat Co. by the government.

A four-masted wooden schooner, the Cordelia E. Hayes, built by Percy & Small, Bath, Me., for J. S. Winslow & Co., Portland, Me., was launched last Saturday. Her dimensions are: Length, 202 ft.; beam, 40.33 ft.; depth, 18.7 ft. She has two decks and a poop and three houses.

Bids for the construction of a patrol boat for Lake Erie will be opened by the Ohio Fish and Game Commission in the office of the auditor of state at Columbus on Tuesday, Sept. 24. Specifications and other necessary information for prospective bidders may be had from the secretary of the commission, whose address is Athens, O.

The Canadian Pacific Railway Co. has decided to place the steamships Tartar and Athenian on the regular Vancouver-Australian route with scheduled sailing dates. These two ocean steamers will increase the regular sailing from Vancouver, and it is expected will give a twelve days' service in the summer time and a three weeks' service in the winter time.

The compound marine engines, both fore and aft and vertical tandem, as built by Marine Iron Works, station A, Chicago, have met with considerable favor on the Atlantic and Gulf of Mexico coasts, that company having built eighteen sets of them for those waters so far this year. 4

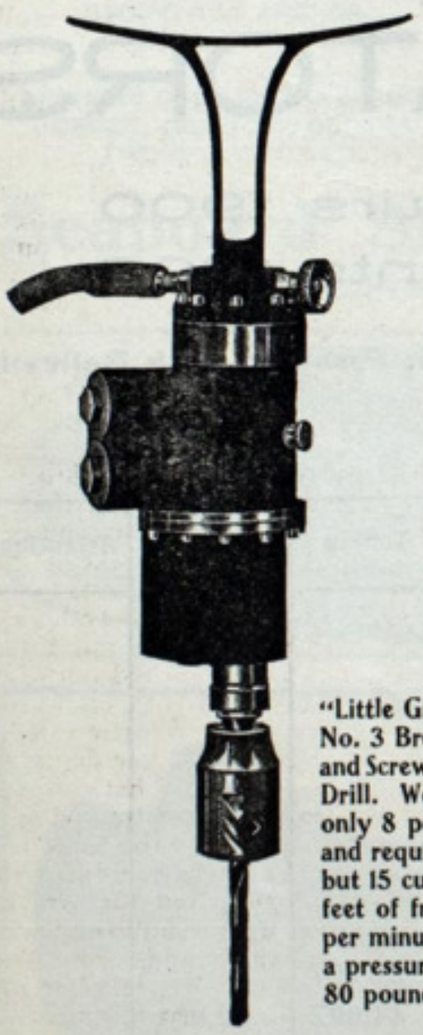
A British admiralty chart, Midland section of Georgian bay, will be sent, postpaid, to any address for $1.25; regular price $1.75. Size of sheet 3x4 ft. The Marine Review Pub. Co., Perry-Payne building, Cleveland. Chart of the whole bay on one sheet at the same price.

"Thirty Days and Costs"

has an ominous sound, but, in this case, it represents a liberal offer. We offer you a 30 days' trial of any **"Little Giant"** Pneumatic Tool, and we pay all the costs of transportation, even if you send it back. That's "thirty days and costs" on us.

We make this offer because in no other way can we so thoroughly demonstrate the all around excellence and general superiority of **"Little Giant"** Pneumatic Tools as by putting them right into your hands for a severe trial, making you judge and jury, and because past experience has shown us that to put **"Little Giant"** Tools into the hands of even a mechanic who is prejudiced in favor of another make, will almost invariably win him over to our side and make of him a good strong witness in the court of public opinion.

"Little Giant" Pneumatic Tools have won a world-wide reputation for simplicity, durability and economy in the use of air, and are supplanting the ordinarily good pneumatic tools in many shops. They are small and compact, easily handled and operated and are made entirely of steel.



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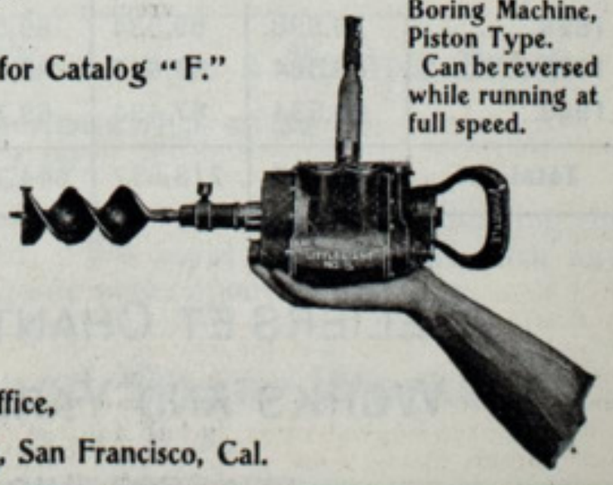
Send for our catalog, which illustrates and describes our entire line of Drills, Hammers, Riveters, Hoists, and other Pneumatic Tools and App'liances, and choose the tool you'd like to try. Do it to-day.

Ask for Catalog "F."



No. 5 Reversible Boring Machine, Piston Type. Can be reversed while running at full speed.

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423 Emma Spreckels Building, San Francisco, Cal.

PROFITS OF STEAMSHIP COMPANIES.

The predominating position in the trade on the east coasts of the Mediterranean is claimed by the German Levant line of Hamburg. It was established in 1890 and the undertaking is capitalized at £200,000, upon which sum it has been possible to pay a dividend of 10 per cent. for 1900 as compared with 7 per cent. in the preceding year. It is understood that the company is subsidized by certain governments, but what amount cannot be definitely ascertained. The profits earned last year reached £27,250, as compared with £17,758 in the previous twelve months, and the former has been arrived at after making provision for depreciation of vessels and allocations to the renewal fund. The necessity for increasing the fleet of twenty-one steamers has become manifest and a further issue of capital to the extent of £100,000 is on the point of being made for this purpose. The working results were specially favorable during the second half of 1900, and the new line from Hamburg and Antwerp to the Syrian coast has proved its utility. Arrangements have been made with the Bulgarian government for the steamers to call at the ports of Burgas and Varna, but the state contribution only takes the form of a guarantee that the expenses incidental to the service shall be covered.

The Hamburg-South American Steam Navigation Co. is the only Hamburg line which has not made any progress during the past year. Yet the profits earned during 1900 amount to £60,000, after having made such provision for depreciation as is known to the company alone, or approximately the same revenue as in the preceding year. Of this sum £56,250 has been divided among the shareholders by the payments of 10 per cent. as in 1899, on a capital of £502,500, the balance being mostly absorbed by the remuneration of the directors. In addition to the share capital there is a mortgage loan amounting to £160,000; the insurance fund amounts to £151,000 and the reserve to £110,500. During the year the freight traffic to the Argentine republic was tolerably satisfactory, but shipments to Brazil were affected in consequence of the continuance of the unfavorable commercial position. The return freights, however, were fairly good.

The last enterprise to be mentioned is the Kosmos Co. of Hamburg. The enviable position occupied by this undertaking may be attributed to its practical immunity from competition, although it is doubtful whether the future record of the company will be maintained at its present stage. To earn in gross profits the sum of £206,420 during 1900 on a capital of £550,000 is a remarkable result, the effect of which is evidenced by the payment of a dividend at the rate of 15 per cent., as compared with 11 per cent. in 1899 on the same amount of capital, when the profits reached a total of £151,830. The handsome dividend absorbs £82,500, the sum written off for depreciation amounts to the formidable figure of £99,250, as against £76,340 in the previous year, and the provision for the boiler renewals and repairs reached £15,930.

During the year the company extended its service on the west coast of America northwardly to San Francisco, eight complete journeys being performed. This service has yielded satisfactory results, although the failure of the crops in Chile, which induced large shipments of corn to the south, contributed to the prosperity. It is believed that the line to California will also prove to be remunerative in the future, notwithstanding the competition which has now arisen on that particular route.

DEVELOPMENT OF CANADA.

Premier Ross of Ontario, in summarizing the industrial progress of the dominion, as reflected in railway legislation, said in a recent address: "It might be worth while, in dealing with railway matters, to summarize the results of the last two or three years of railway legislation. First, we shall have running from Port Arthur to the mouth of the Rainy river, in Ontario, a distance of 285 miles, and thence to Winnipeg, 130 miles, a line of railway which will open up extensive iron mines on the north shore of Lake Superior, and lead to the fertile valley of the Rainy river. Second, the road from Sault Ste. Marie to the Canadian Pacific railway, known as the Algoma Central, a distance of 140 miles, will in all probability be completed in another year. Then a short railway from Bruce mines to Copper mines, at Rock lake, a distance of 13 miles. Then east of that comes the Manitoulin & North Shore railway, 330 miles, to be completed in five years. Then east of that, from Parry Sound to Sudbury, 90 miles, an important road on which operations will begin this summer, if they have not already begun. Then we have the railway into the Temiscamingue, a distance of 100 miles, of which the surveys are now being made. That gives 953 miles of railway, one-half of which is being built without charge to the treasury of a single dollar—the land grant being accepted in lieu of a cash subsidy. You can estimate for yourself the effect which this railway development must have upon New Ontario, upon its gold and silver and copper mines. In old Ontario we have given small subsidies to perfect our railway connection in the east, and which, when fully carried out, will give a continuous connection through Lindsay eastward to Ottawa. The capital required will probably be $20,000,000, all of which will go to build up our Canadian industries and to give employment chiefly to our own people."

H. J. Wessinger of Virginia, Minn., superintendent of the American Mining Co.'s properties at that point, has been appointed mechanical engineer for the United States Steel Corporation in the mining division of Minnesota, Wisconsin and Michigan. The American Mining Co. was formed to operate the mines of the American Steel & Wire Co., now a part of the steel corporation. Mr. Wessinger's headquarters will probably be in Duluth.

Arthur D. Story, Essex, Mass., has been awarded the contract for constructing a steam lighter for the government engineer at Boston for $19,450.

Low Rate Excursion to New York via B. & O.—Tickets on sale daily until Oct. 20 with privilege of returning via Buffalo. Call at city ticket office, 241 Superior street. Oct. 20.

BELLEVILLE GENERATORS

Grand Prix 1889 — Hors Concours 1900
Originated 1849 — Latest Improvements 1896

Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890	67,728	2,460										
1891	68,247	68,331	204									
1892	68,247	68,403	69,822	23,259								
1893	68 379	68,343	68,286	68,247								
1894	68,439	68,367	68,574	68,439	37,701							
1895	68,673	68,766	68,739	68,808	40,887	28,713						
1896	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

ATELIERS ET CHANTIERS DE L'ERMITAGE, À ST. DENIS (SEINE), FRANCE.
WORKS AND YARDS OF L'ERMITAGE AT ST. DENIS (SEINE), FRANCE.
TELEGRAPHIC ADDRESS: BELLEVILLE, SAINT-DENIS-SUR-SEINE.

TRADE NOTES.

The Atlantic Works, Incorporated, of Philadelphia, recently shipped one of their bevel band saw machines for ship yard work to the Willadsen Dry Dock Co., Hoboken, N. J.

Mr. Thomas Congdon, principal surveyor in the United States of Lloyd's register, has retired after nearly forty-six years of service, twenty years of which has been spent in the United States. Mr. George Stanbury has been appointed Mr. Congdon's successor.

A concern which sends out most excellent little catalogues is the Buffalo Forge Co., Buffalo, N. Y. The one under discussion has to do with Buffalo disk wheels—pulley, steam and electric. The form of the Buffalo disk wheel was adopted after exhaustive experimenting to determine the most efficient pattern and as a direct result of this the power consumption for moving any given volume of air is a minimum for this style of fan. These disk wheels deliver air in a direct parallel to the axis of rotation and are unexcelled for all situations to which this type of fan is adapted.

The Buffalo steel plate planing mill exhausters are special types of centrifugal fans, and are applied for the purpose of exhausting shavings and sawdust from wood-working machines, refuse from emery wheels and buffing wheels and for other purposes of a like nature. A small catalogue just issued by the Buffalo Forge Co., Buffalo, N. Y., illustrates and describes the various kinds of this type of fan. The Buffalo Forge Co. has recently perfected its shavings and dust separator and the type now being constructed is illustrated in a new folder. Copies of these books will be sent to any one upon application.

A beautifully embossed catalogue in silver and green has been issued by the new Britain Machine Co., New Britain, Conn., and is devoted to the Case automatic high speed engine. This engine is built in sizes from 2½ to 25 H.P. Of the type of engine the catalogue says that it is remarkable for simplicity, direct action, compactness, lightness of moving parts, large wearing surfaces, automatic lubrication and perfect regulation. It is evident that these are the essential requirements of the best attainable high speed engine. Badt-Goltz Engineering Co., 1504 Monadnock building, Chicago, are the western agents of this company.

The Dutton Engineering Co., Perth Amboy, N. J., are builders of high-class gasoline motors and complete launches and are also makers of propeller wheels and fittings. The company says that when intelligently designed and well built the gasoline motor is an exceedingly simple, certain, safe and inexpensive power for small boat propulsion. There is no boiler, no fire, no water to provide, no waiting to get up steam, no danger of explosion or scalding from broken steam fittings, no smoke, no appreciable heat, no license fees and no annoying inspections or examinations. The sewing machine is complicated in comparison to the gasoline motor.

John S. Bushnell Co., 126 Liberty street, New York, have issued a tasty little catalogue devoted to their steam specialties—Lippincott steam separators and oil extractors, union furnace blowers and shaking grate bars. The Lippincott separator was designed with three objects in view. First, that it should be structurally strong to safely withstand high pressures and the strains caused by expansion and contraction of long lines of pipe; second, to secure a free passage for the steam and no fall in pressure (it acts as a receiver and materially assists in maintaining a straight steam line); third, to divert the water or oil from the path of the steam current instantly and prevent further contact. The catalogue will be sent to anyone upon application.

Work on the five-masted schooner for the Sutton fleet of New Haven is progressing rapidly at the yards of the Holmes Ship Building Co., West Mystic, Conn.

PROPOSED PATROL BOAT FOR USE OF OHIO FISH AND GAME COMMISSION IN WATERS OF LAKE ERIE.

The Ohio Fish and Game Commission will receive bids at Auditor of State's office, Columbus, Ohio, two P. M., Tuesday, September 24th, for the construction of a patrol boat for use in the waters of Lake Erie. Plans and specifications may be seen at Auditor of State's office, Columbus, Ohio, or copies of same may be secured upon application from the Secretary of Ohio Fish and Game Commission, Athens, Ohio. The Commission reserves the right to reject any or all bids. Bids may be mailed to Ohio Fish and Game Commission, care Auditor of State's office, Columbus, Ohio. Aug. 29.

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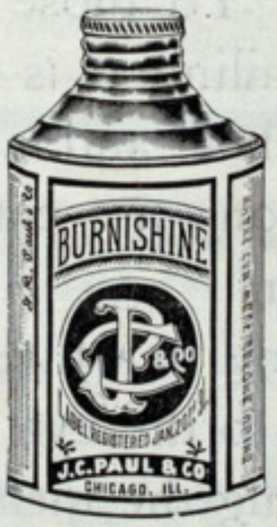

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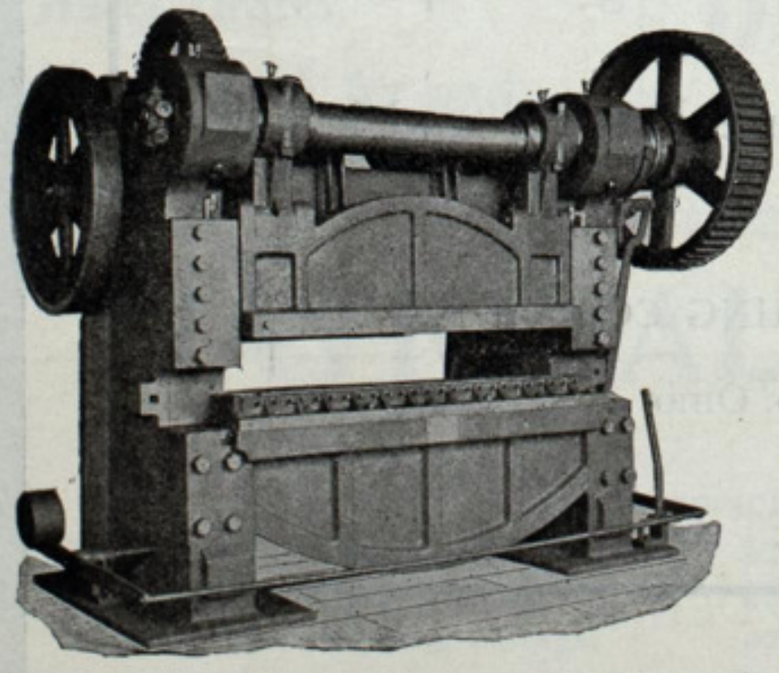

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The book is bound in white duck and stamped with blue ink and is most fetching to the eye. Between its covers 500 pages are devoted to defining the meaning of words in nautical literature. If there is a word in that ought to be out, or a word out that ought to be in, we should know it. We don't think there is.

The book is of vital interest to nautical students, men of the merchant marine and navy, masters and engineers, admiralty lawyers and everyone concerned about the building and operation of a ship.

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U. S. Engineer Office, Jones Building, Detroit, Mich., Aug. 8, 1901. Sealed proposals for dredging under continuing contracts, for improving Hay Lake Channel, St. Mary's River, Mich., will be received here until 12 noon (standard time), Aug. 31, 1901, and then publicly opened. Information furnished on application. G. J. Lydecker, Col., Engrs.
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WANTED—Second-hand engine of beam type and about 32 in. by 6 ft. Address box 400, the Marine Review Pub. Co., Cleveland, O. d

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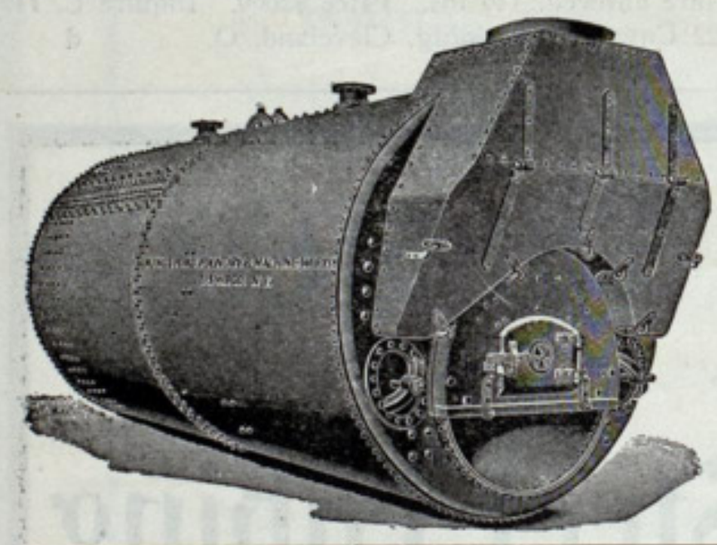

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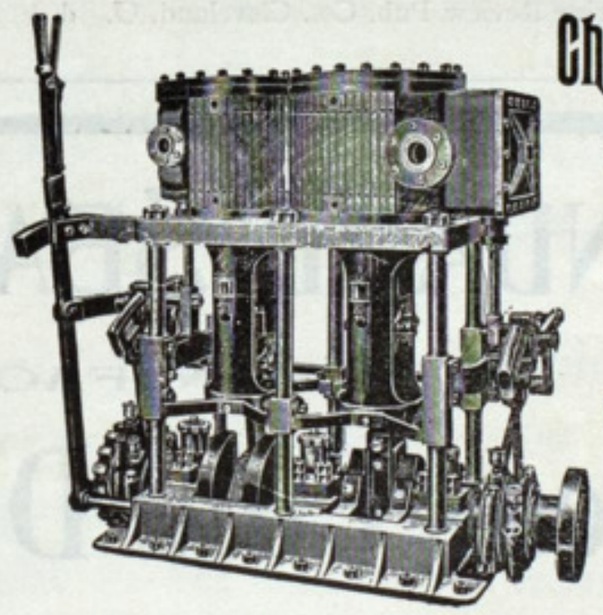

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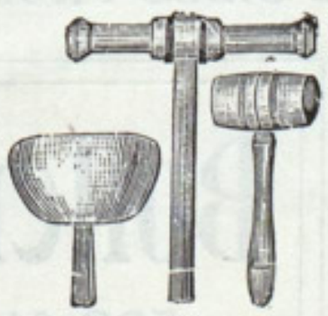

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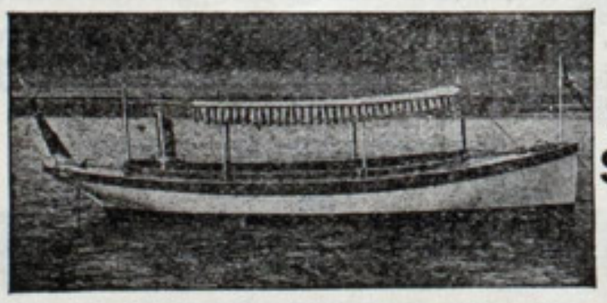

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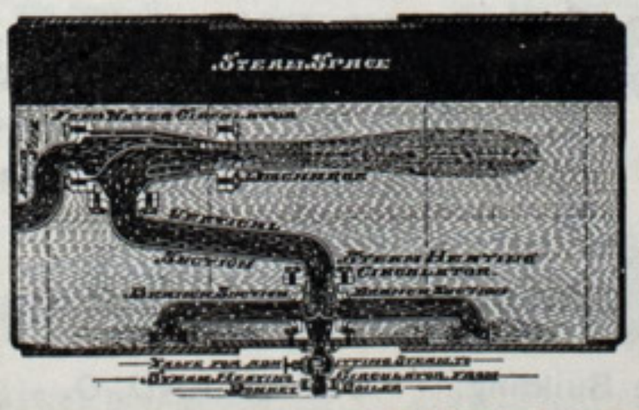

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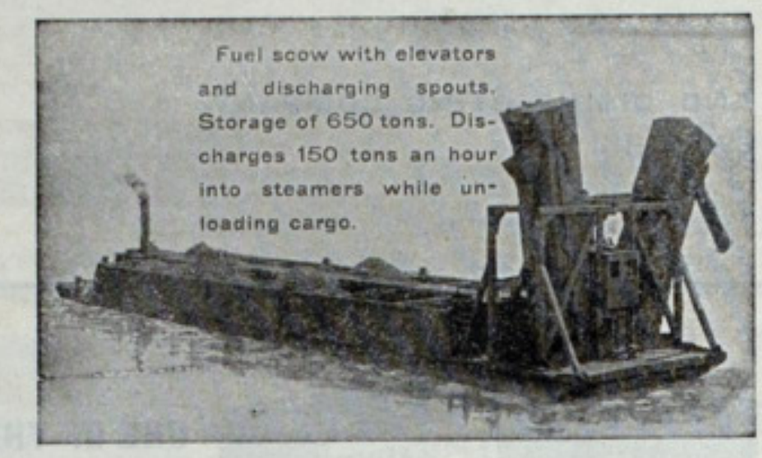

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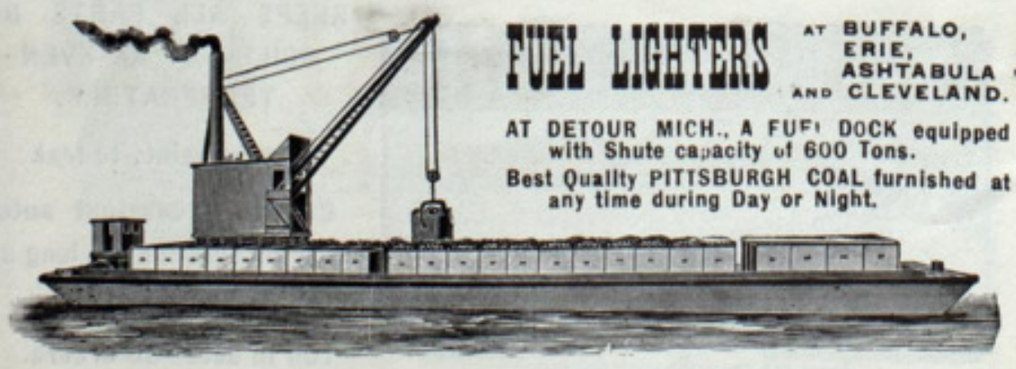

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Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PIPE THREADING AND CUTTING MACHINES.
Merrell Mnfg. Co.....Toledo, O.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.
Crane Co.....Chicago.

PLANERS OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PLATE BENDING AND PLANING MACHINES.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

PLUMBING, MARINE.
Reilly Repair & Supply Co., James.....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.
Paul & Co., J. C.....Chicago.

PRESSURE REGULATORS.
D'Este Co., Julian.....Boston.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath, Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Union Iron Works.....San Francisco.

PROJECTORS, ELECTRIC.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Wood, R. D. & Co.....Philadelphia.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood, R. D. & Co.....Philadelphia.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Automatic Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

R. I. W. DAMP RESISTING PAINT.
Toch Bros.....New York.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER GOODS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

RUBBER INSULATED WIRES.
Roebling's Sons, John A.....New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SEAM COMPOSITION AND ELASTIC SEAM PAINT.
Cole & Kuhls.....Brooklyn.

SEARCH LIGHTS.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

SHAPERS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
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Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Trigg, Wm. R. Co.....Richmond, Va.
Union Iron Works.....San Francisco.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James.....New York.
Upson-Walton Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SPARS—LARGE SIZES.
Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.
Holmes, Samuel.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.
Algoma Central Co.....Sault Ste. Marie, Ont.
American Line.....New York.
Cleveland & Buffalo Transit Co.....Cleveland.
Dominion Line .....Boston.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL CASTINGS.
Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.
American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mnfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.
Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.
Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

SUBMARINE DIVING APPARATUS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

SURVEYORS, MARINE.
Gaskin, Edward .....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.
Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.
Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.
Helios-Upton Co.....Peabody, Mass.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.
Standard Pneumatic Tool Co.....Chicago.
Watson-Stillman Co.....New York.
Wood, R. D. & Co.....Philadelphia.

TOOLS, WOOD WORKING.
Atlantic Works, Inc.....Philadelphia.

TOPOPHONE—Prevents disasters in fogs.
Colt Co. J. B.....New York.

TOWING MACHINES.
American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

TRAPS, STEAM.
D'Este Co., Julian.....Boston.
Haines Co., Wm. S.....Philadelphia.

TRUCKS.
Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.
Benedict & Burnham Mnfg. Co.....Waterbury, Conn.
Standard Seamless Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co.....Chicago.
Crosby Steam Gage & Valve Co.....Boston.
D'Este Co., Julian.....Boston.
Jenkins Bros.....New York.
Wood & Co., R. D.....Philadelphia.

VARNISH PAINT.
Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.
Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hall & Root.....Buffalo.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Kennedy Hunter & Co.....Antwerp.
Mitchell & Co.....Cleveland.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Tandy, Frank N.....Boston.

VENTILATING APPARATUS FOR SHIPS.
American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.
American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A.....New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.
Signal & Control Co.....New York.

WINDLASSES.
American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.
American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.
Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.
Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.
Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.
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Lane & DeGroot.....Brooklyn.
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YAWLS.
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No. 46, Southwestern Express	.....	*3 00 pm
No. 6, Limited Fast Mail	*5 40 pm	*5 45 pm
No. 10, Chicago, New York & Boston Special	*7 35 pm	*7 40 pm
No. 16, New England Express	*10 30 pm	*10 35 pm
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No. 126, Norwalk Accommodation	†7 55 am	.....
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No. 15, New York, Boston & Chicago Special	*3 05 am	*3 10 am
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No. 47, Accommodation	.....	†3 00 pm
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No. 3, Fast Mail Limited	*10 50 pm	*10 55 pm
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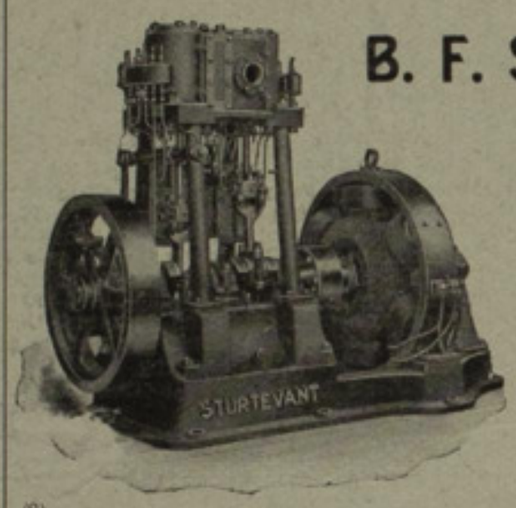

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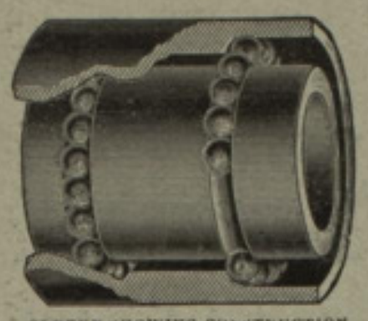

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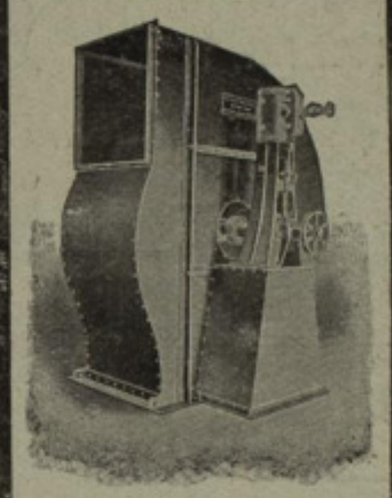

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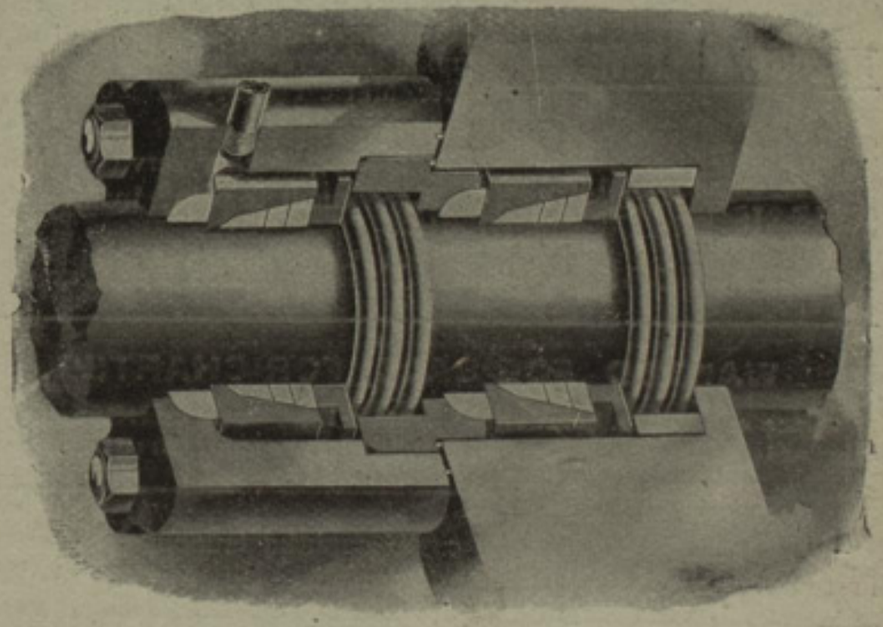

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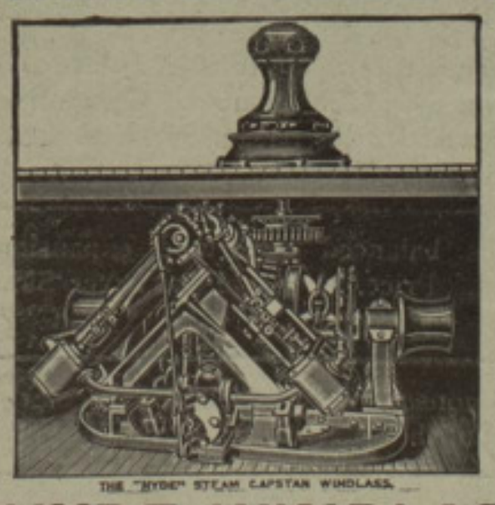

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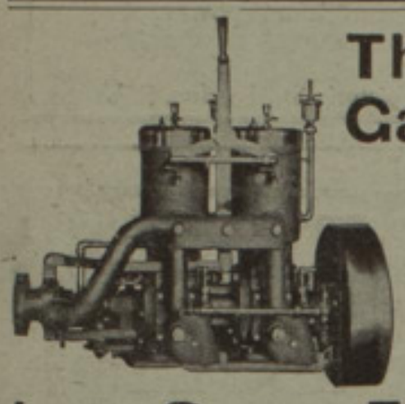

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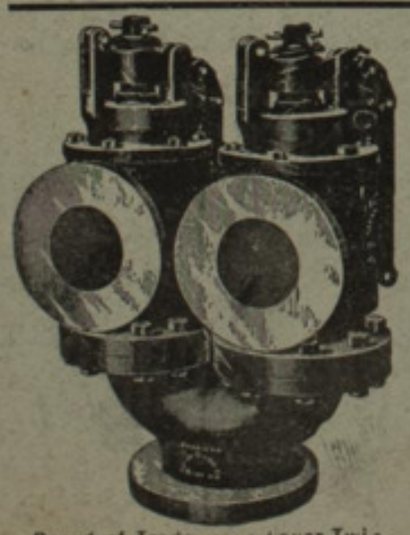

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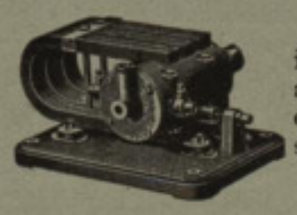

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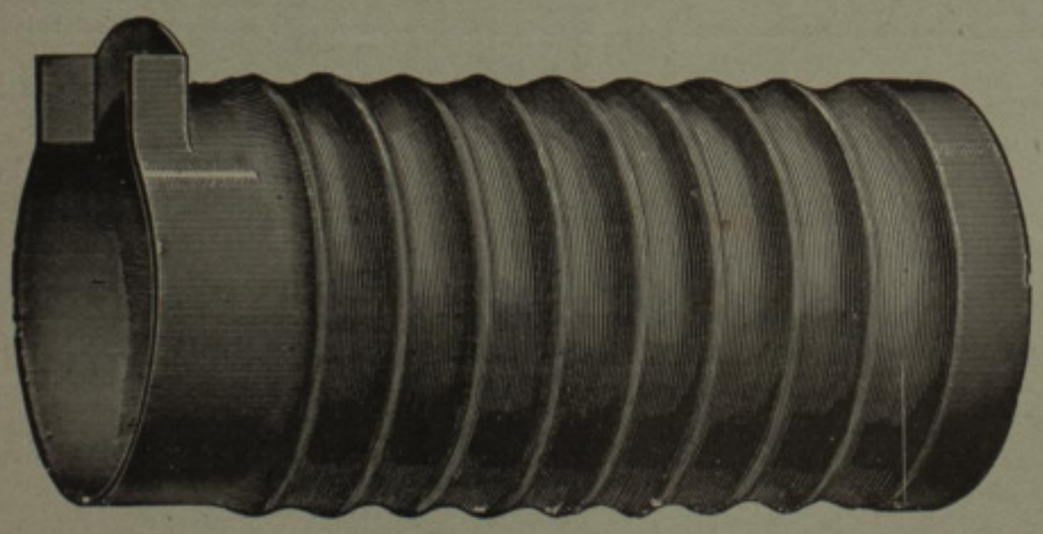

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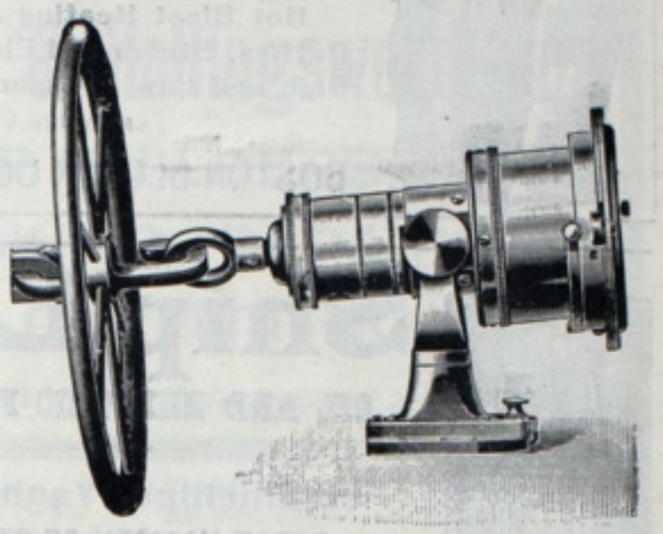

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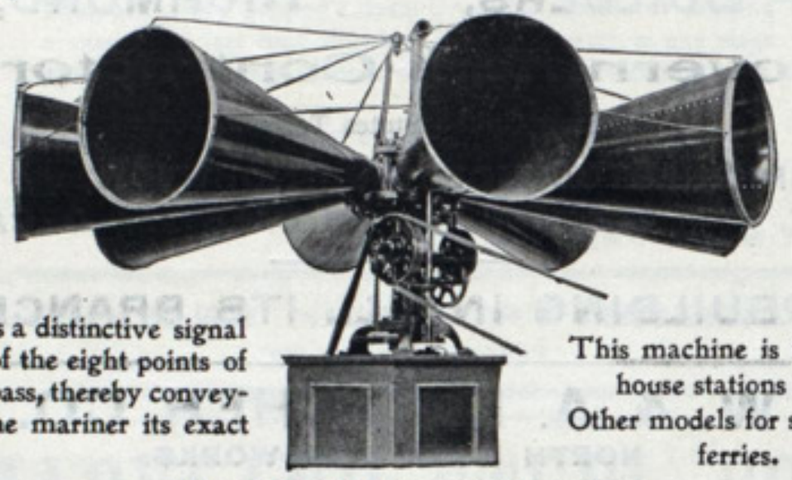

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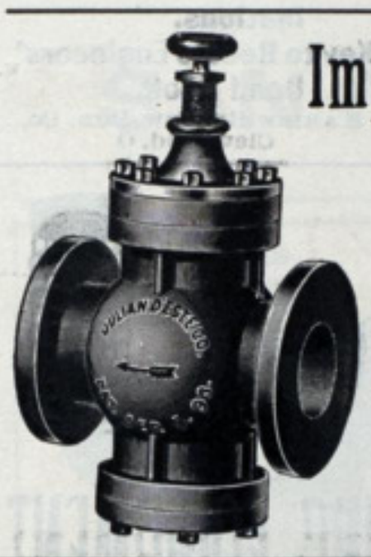

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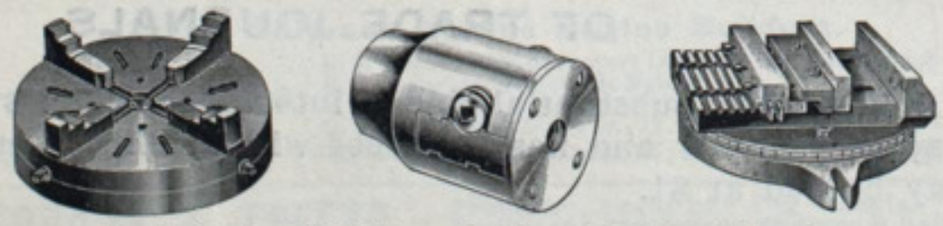

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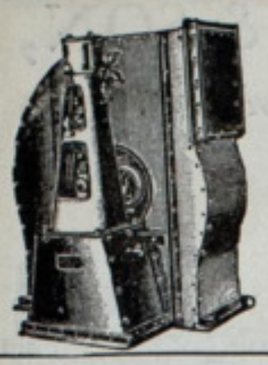

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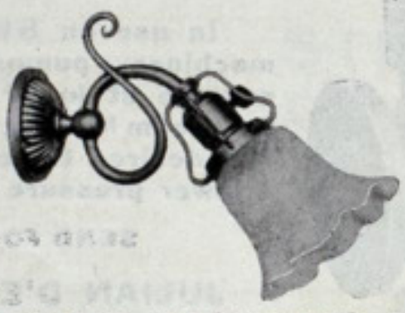

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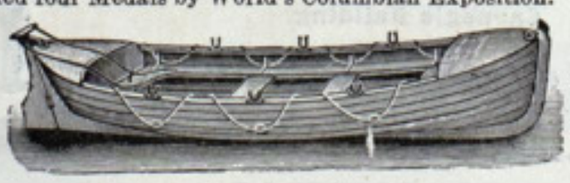

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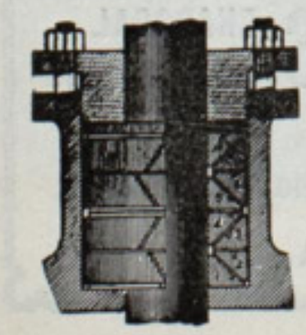

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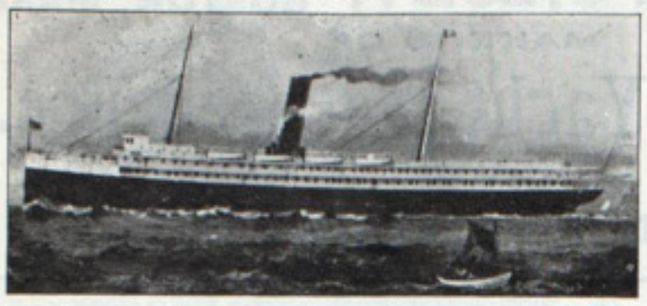

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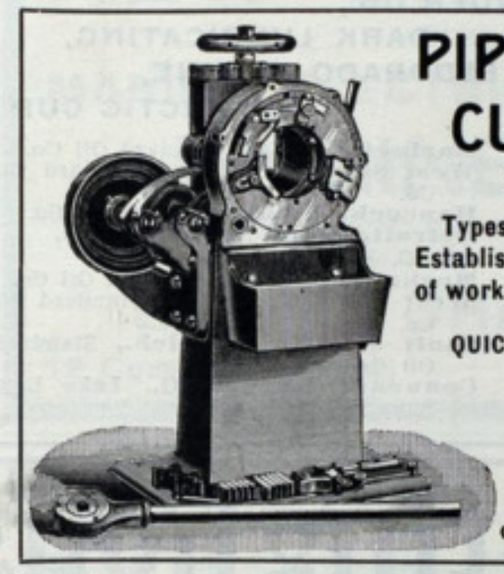

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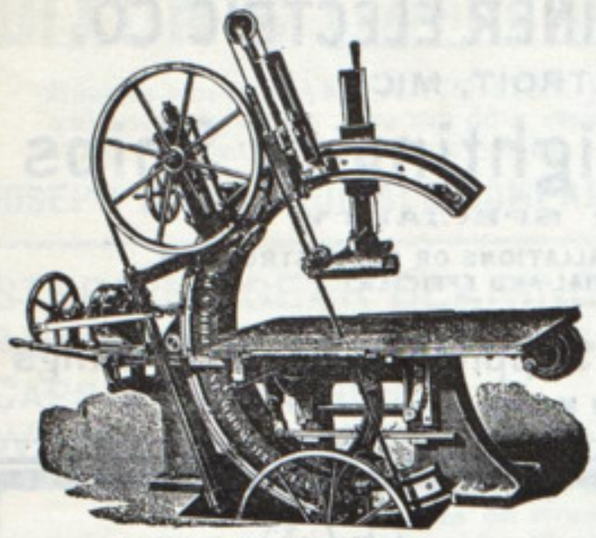

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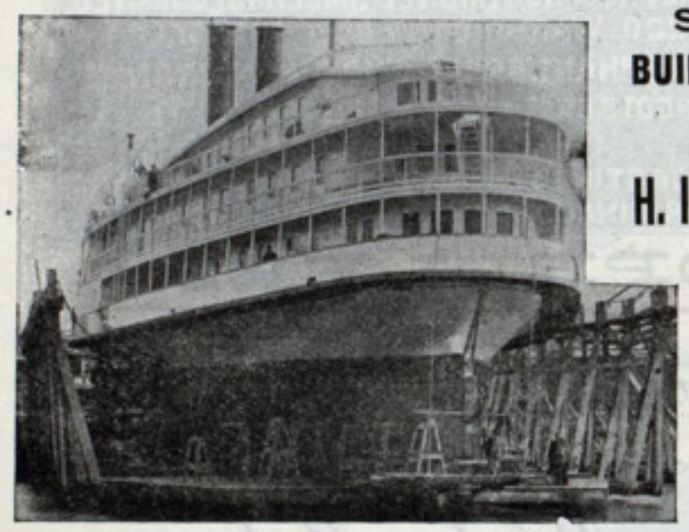

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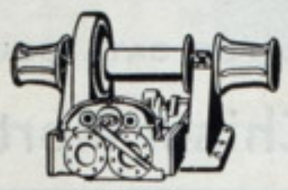

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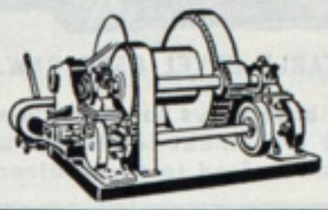

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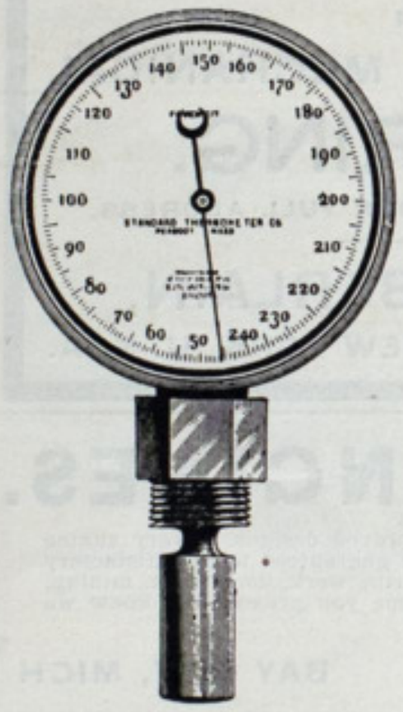

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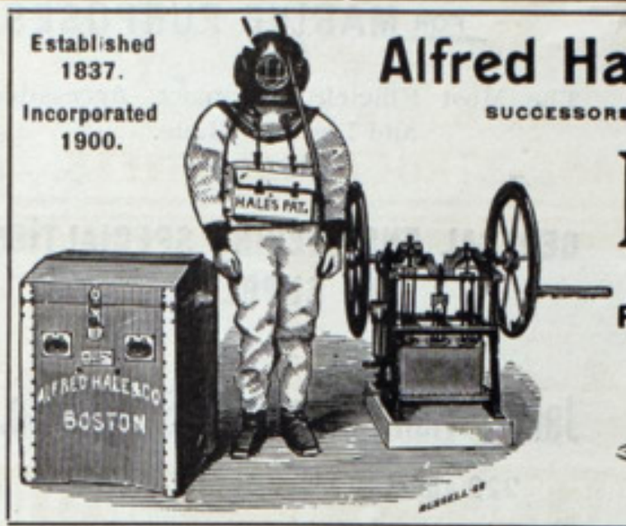

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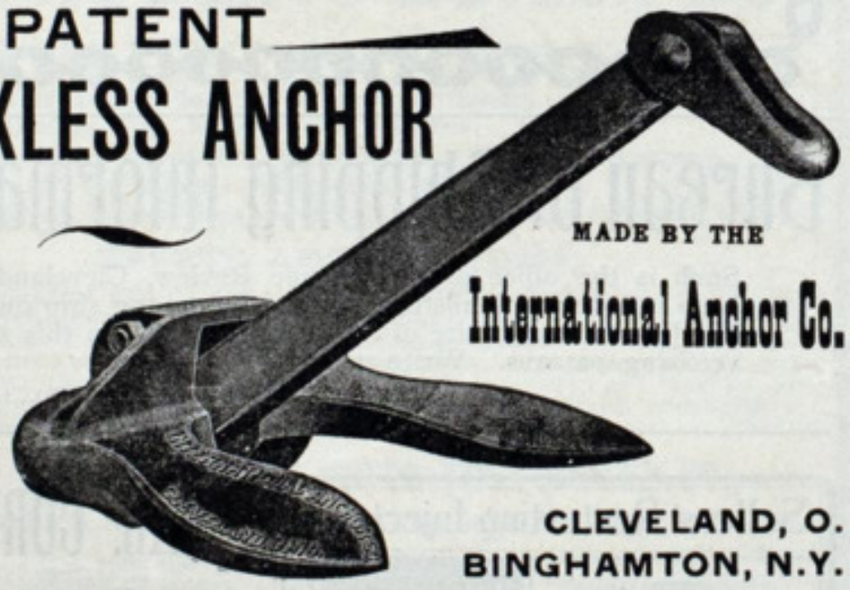

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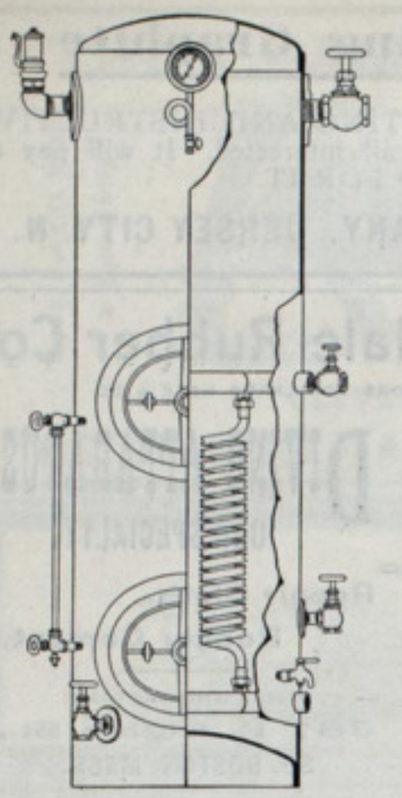

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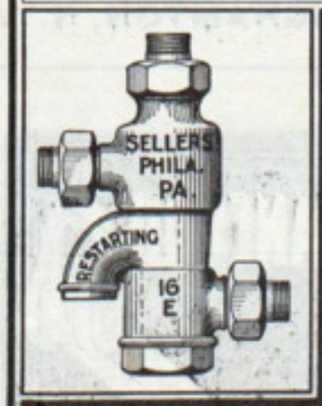

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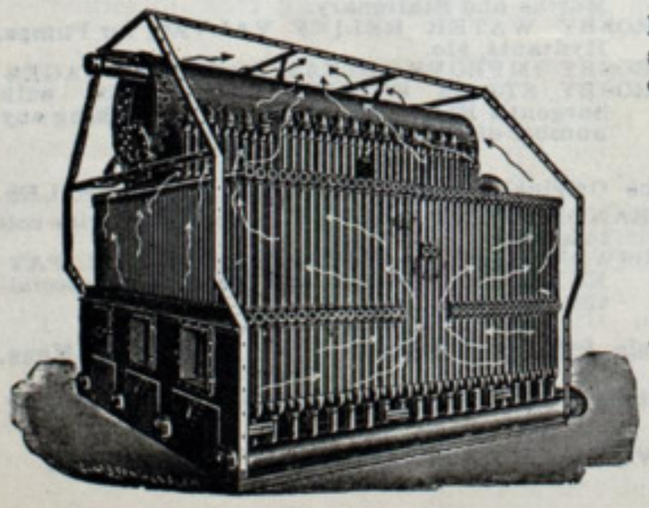

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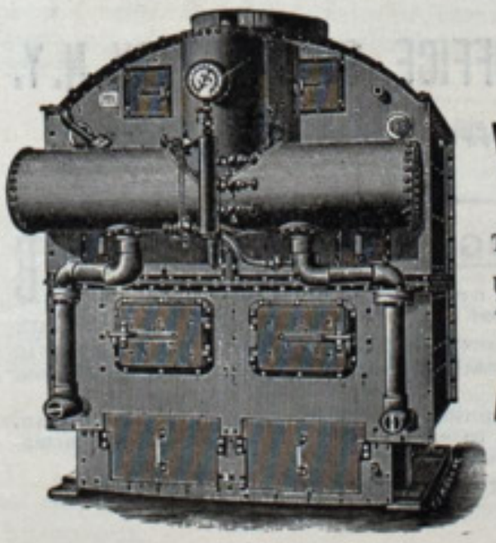

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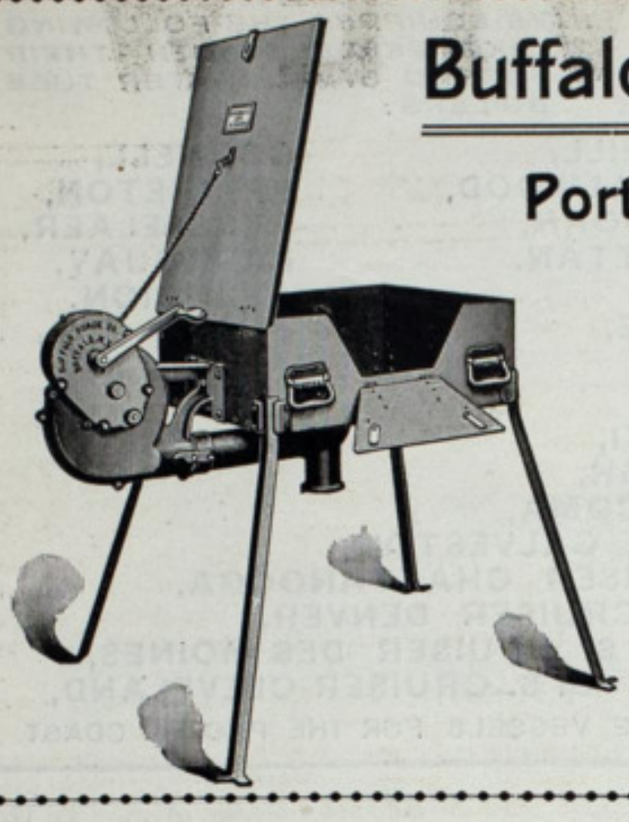

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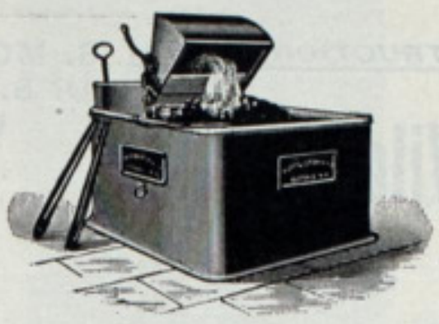

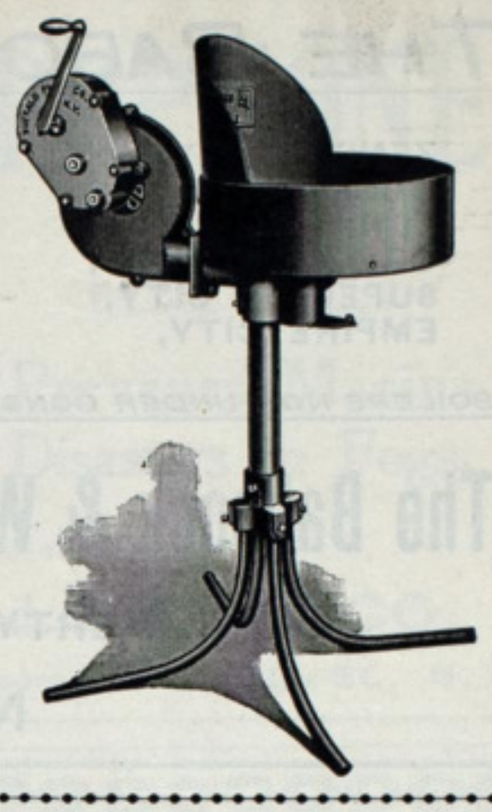

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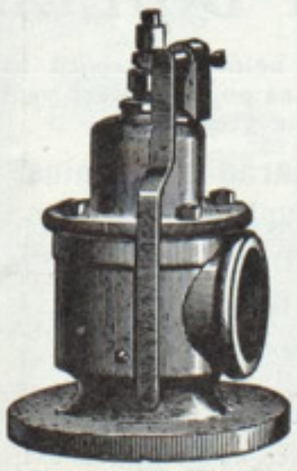

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